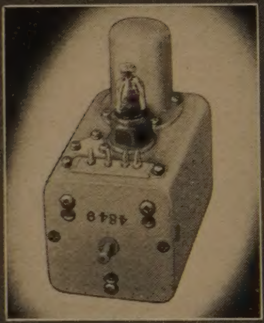
NOVEMBER
1953

CQ RADIO AMATEURS' JOURNAL

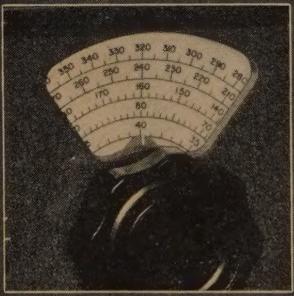
35c

COLLINS 32V-3

A self-contained table-top transmitter



Pick your frequency with the built-in 70E-8 VFO



You can count the kilocycles on the 32V-3 dial

- With this popular transmitter you QSY from the high end of 10 to the low end of 80 in a few seconds; just pick your band and set the built-in VFO to the desired spot. The 32V-3 will stay there — its frequency is controlled by the highly stable, built-in 70E-8 VFO.

- Have you ever wondered why the 32V-3 sounds so powerful on phone? It's because the audio circuits are Collins-designed and Collins-built for peak performance at speech frequencies.

- And, of course, spurious radiation has been reduced to an absolute minimum.

- The Collins 32V-3 runs 160 watts on cw and 140 watts on phone.

See your Collins distributor today for information on this popular transmitter.

For the best in amateur equipment, it's . . .

COLLINS RADIO COMPANY, Cedar Rapids, Iowa

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COLLINS

CQ RADIO AMATEURS' JOURNAL

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OUR COVER

Roy Morris, W2QYS and W2AVA (seated) operating Bill Harrison's generator-powered Civil Defense field station. Complete in every respect, including Gonset, National and Collins equipment, this portable unit has been assigned to Area 1, New York State Command Net. A 2-meter ground plane antenna extends from the top of a Premax 36-foot telescoping mast. The PA speaker is connected to the Gonset "Communicator." A 96-inch whip antenna projects from the top of the station wagon. It is used on 10 meters and can be based loaded for the other bands.
(Photographed by Joe Schimmel, W2QDM)

FEATURE ARTICLES

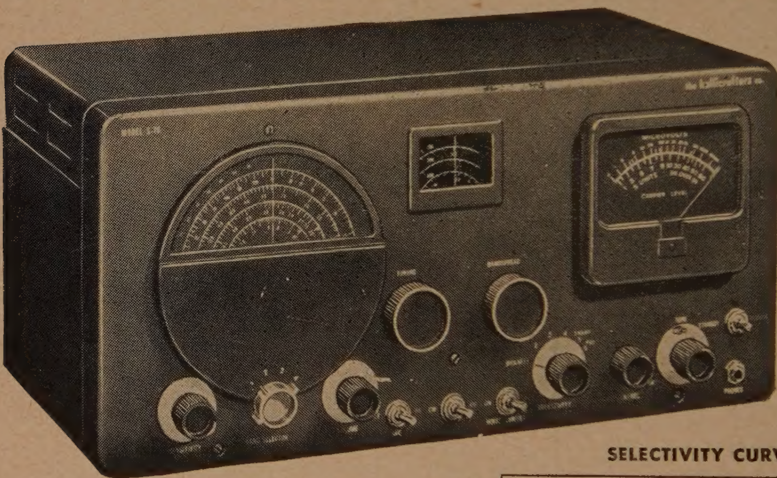
Departments

Miscellaneous

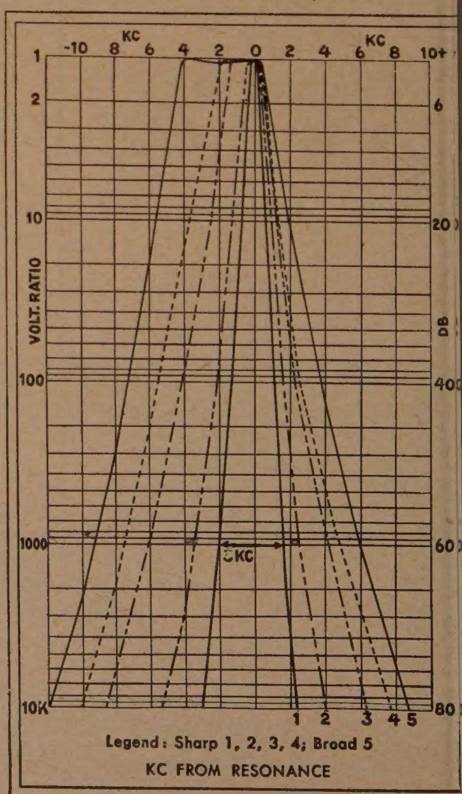
Check the specs...
Check the performance...

AND YOU'LL CHOOSE

Do you know any better way, any other way, to judge SW equipment than to check the specifications and the performance? Frankly that's the only valid way we can think of to make sure you get your money's worth. Check these specs. Take a look at the selectivity curve for the S-76. It is typical of the outstanding value Hallicrafters offers in every price class.



SELECTIVITY CURVES, S-76



Model S-76

Double conversion receiver. Broadcast Band 538-1580 kc plus three short-wave bands covering 1720 kc-34 Mc.

Calibrated electrical bandspread for easy tuning. Double superhet with 50 kc second i-f and giant 4-inch "S" meter. Five position selectivity, one r-f, two conversion, two i-f stages, temperature compensated. 3.2 or 500 ohm outputs.

Satin black steel cabinet. 18½" x 8⅞" x 9½" deep. Nine tubes, plus voltage regulator and rectifier.

For 105/125V.50/60 cycle AC
Use R-46 speaker . . . . $199^95

Feenix, Ariz

Deer Hon. Ed:

If you are knowing of any good bargains aroun town, letting me know, on acct. if anybuddies selling I'm buying. Boy oh boys, am I loaded down with th bux. Hon. Ed., Scratchi not filthy with money, he ar wallowing in mud with the stuff. Wowie! what feeling. I having so much money I considering sub scribing to your Hon. Mag., instead of buying sam fourth-hand at Joe's Triple-Dip Hunky-Dory Ic Cream and Used Magazine Parlor.

No, you needing not bother to looking throug noosepaper to see what bank in Feenix are havin been robbed resently. I are getting this money o acct. I not only reel smart gentlefellows, but quick thinker and geenyus to boot. But letting me begin a the commencing.

This past summer Hon. Brother Itchi are decidin it doing me good if I not staying around ranch, bu getting out and seeing sum other parts of Hon. State I agreeing, as only getting in trubbles at ranch Howsumever, not doing much—as being withou monies—until month ago, when I offered job at bi dood ranch down near Toosahn. It seeming the having lots of boys 12 to 16 years old who wantin to learn how to being radio amchoors. The second I learning they willing to pay for deal likesame this I throwing a few clothes and lotsa radio parts i back of car and I'm off.

Now don't quick packing up your Hon. Suitcase because I not rolling in bux from what they paying In fack, my salary are five measly bux a week, wit room, food, and all the horses I can ride. Ha! Yo can putting all the horses I wanting to ride inside trans-sister and still having room left over for th geraniums. I not discouraged, on acct. food is goo scenery are collosus and the class are small.

By second week are teeching young kids how t making one-toob regenerative reseever. Idear goin over grate after getting enough headphones s everybuddies can listening at once. Next, we ar starting code practise, by listening in on amchoo bands. We getting along like peechy for cupp days, until one nite we heering sum left-footed sende who not making sense. He sending stuff lik XBGJKL WYTOPW QKLTPZ and soforths.

We figuring this characters off his rockers unt we heering him several nites after that, sending fo ten minutes, then off for awhiles, then on agai Finally I deciding to making copy of same. A

(Continued on page 8)

(from page 6)

filling many pages with messages, and next day showing them to friend of mine who Hon. Chief Op. at Border Patrol station neerby. This gentlefellows not only 1/c op. but he having much exspeariants during last war desiphoning codes. After he over looking all the messages I bringing, he saying it un-probably meening anything, but he letting me know.

Not heering anything from silence for too days, then this selfsame Chief. Op. calling on landline and telling me to hotsfooting it to Border Patrol station immeedjutly. I telling my class to designing for-toob reseever while I gone and off I go. When getting to station, Hon. Chief Op. grinning from ear to ear. He handing me envelope and telling me it all mine. Hackensaki! it are loaded with twenty dollar bills!! I not even saying howcomes before he explaining how messages are reel honest-to-gracious spy mes-sages. Are being sent by fellows who heading up ring of smugglers. Border Patrol getting dope from my messages and rounding up hole gang. Scratchi getting all the reward money.

Are hardly recovering from money when Hon. Chief Inspecktor coming in room, shaking hand, and appointing me Honorary Border Patrolman—even giving me shiny new badge. I are so exuberate I jumping in car and driving all way back to Itchi's ranch. Whooey! My class can go on designing for toob reseevers forever, but they not having champeen spy catcher Scratchi working at five measly bux a week.

Itchi and I counting money together, and I having twenty-five hundred smackers. My sacred Ant Fuji I never seeing so much monies in my life. After this Hon. Ed., please addressing me as Hon. Patrolman Scratchi.

Excoosing me, Brother Itchi coming in room. He say he been figuring out, and if I paying ate hundred dollars he being able to paying income tax. INCOME TAX!! Hon. Ed., are you knowing a good lawyer what's cheep? I won't pay it. It's an outrage!! You think it easier to leeving home and heading for hills? Letting me know quicklike, before income tax man gets here.

Respectively yours,
Hashafisti Scratchi

"... Nice signal, OM ... my number ... gulp ... 316280 ... seeuagin ... overnoff ... gulp. CQ contest, CQ contest ..."

Zero Bias . . .

Docket No. 10712

On October 6th, the Federal Communications Commission released a "Notice of Proposed Rule Making" which would authorize Novice and Technician class licenses to be taken in the same manner as the present Conditional class license, i.e., by mail. (Particularly note: this is not a definite rule, but only a proposal which may possibly be enacted into the Rules and Regulations in 1954.)

The written and code portions of the examination would be conducted under the supervision of not more than two volunteer examiners either designated by the Commission or, under some circumstances, selected by the applicant. One examiner would conduct the code test and the other would handle the written theory portion of the test. The results of these examinations would then be attested to by the examiners and mailed to the nearest FCC Field Office. This is the identical procedure that the Commission has used for a number of years to provide a method of obtaining a license for the applicant who cannot reach a Field Office where examinations are periodically held.

The current proposal would also reduce the minimum distance that the Conditional class license need be from the examining point from 125 to 50 airline miles. Thus, not only would this docket permit the prospective Novice to take his examination, literally speaking, "by mail," but if he were also over 50 miles from the nearest Field Office, he could at a later date take a Conditional class examination that would give him the same operating privileges as the General class license holder. In addition, this docket would make it no longer necessary to submit to re-examination should the Conditional class licensee move to within 50 miles of the nearest field and examining office.

The Commission has indicated that these steps are being contemplated primarily in the interests of "stepping up" the processing of amateur licensing. While it is impossible to accurately estimate the work that might be saved by the Commission should this plan be authorized, it is fairly safe to say that many important questions arise as to where the "time" is going to be saved, and how the processing is going to be "accelerated."

On the favorable side of the ledger, it is immediately obvious that the "conditions" under which an examination is being held will inevitably influence its results. Many prospective Novice or Conditional license holders will find it much more "comfortable" to have the examination given under the eyes of friends, or at least in surroundings that are familiar to the applicant. This would certainly tend to increase the total number of radio amateurs regardless of class. The past number of failures in the Conditional versus the General class examinations has clearly indicated that sometimes only one-tenth as many failures occur in the Conditional as compared to the General applications. There is little reason to suspect that this same approximation will not be carried into this new proposal and thus "accelerate" the number of applicants making the grade.

On the other side of the ledger, should the number of successful applicants suddenly increase, we are forced to ask where the time is saved by the Commission. The examinations still must be "graded" by the Field Office. While a minor amount of time will be saved by the Field Offices by not physically giving the examination, will not this saving only displace the work load into another division of the Commission (allocation of calls, etc.) which might result in the slowing down of the full licensing procedure from yet another quarter? It seems doubtful whether, on this one point alone, this docket is in the best interests of new Hams.

While the Commission has previously ruled against the "emotional" aspect in handing down decisions as they concern the Amateur Service, it is appropriate to mention that the new docket somehow is "degrading." The pride of accomplishment, as established by the so-called "Extra class license," is incompatible with the philosophy expressed under the new proposal.

Comments on this Docket may be filed with the FCC on or before December 31, 1953.

o.p.f.

The Servo amplifier and rotator is mounted in the attic at the base of the 20-meter beam. Directly above the bearing is the coaxial feedline input connector.

This is the Solution to the Problem of Designing your Antenna Rotator—Let a Servo Point the Beam Automatically

Antenna Rotation with a Servo-Mechanism

HENRY G. ELWELL, JR., W2JKH

350 Hamilton Place, Hackensack, N.J.

The usual procedure in changing the direc-ion of a remotely-controlled rotary beam is to nap on the motor switch, watch the direction ndicator until the beam reaches the desired position, and then snap off the switch. Many mateurs attempt to set their VFO's, fill out their ogs, monitor the band, or what have you, while he beam is turning. Quite often the result is hat the next time they glance at the indicator hey discover that the antenna has passed the lesired position and is continuing on its way or has come to rest against the rotation stop. As W2JKH, however, I merely turn the antenna ontroller to the desired position and forget it, ecure in the knowledge that, when the antenna eaches this position, rotation will cease. A imple servo-mechanism is the secret.

How a Servo-System Works

Figure 1 is the block diagram of a basic servo ystem, whether it is used to steer an ocean liner or to operate a furnace thermostat. The *Mixer-Feedback* circuit generates the signal that controls the system. When it is balanced, no error signal is fed into the amplifier, and no power is fed to the motor. Should the position of either the load or the controller be changed, a signal of phase and magnitude to correspond to the displacement is developed, causing the motor to move sufficiently in the opposite direction to re-establish circuit equilibrium.

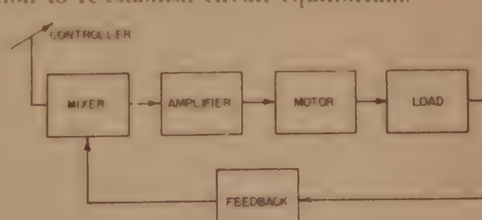


Fig. 1. Block diagram of the basic servo-system.

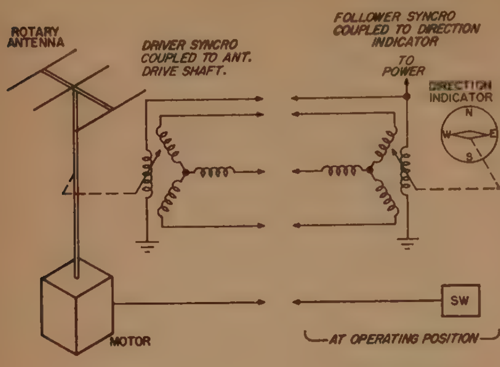


Fig. 2A. Conventional rotary beam antenna with synchro attachment for direction indication to the shack.

Various devices are used in the *Mixer-Feedback* loop. One satisfactory arrangement is a pair of Syncro or Selsyn motors of the type frequently used as antenna direction indicators. *Figure 2A* shows how they are employed as direction indicators and *Fig. 2B* in a servo-system. In *Fig. 2A* both rotors are connected to an a-c power source. When they are in the same relative position, the voltages induced into the stators are equal in value and opposite in phase; therefore no torque is developed. As the beam moves, the "driver" Syncro rotor is turned, thereby generating a torque, and the "indicator" rotor turns to restore balance.

In *Fig. 2B*, only the "driver" rotor is connected to the power source. The "mixer" rotor is connected to the input of the amplifier. To understand the operation of the Syncros in this application, consider them as a two-part transformer, with variable coupling between the primary and secondary windings. The interconnected stators act as the coupling medium between them.

When the rotors are in the same phase, coupling is maximum, and when the phase difference is ninety degrees, coupling is minimum. The

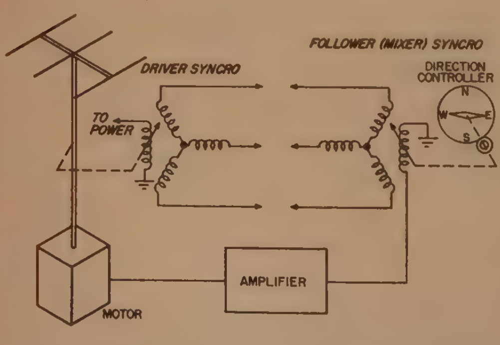


Fig. 2B. Servo-system showing the slight difference between this automatic system and the one pictured above in Fig. 2A. Addition of the amplifier diagramed in Fig. 3 makes all antenna positioning fully automatic from the operating position.

ninety-degree position is "normal," displacement from it couples part of the supply voltage into the amplifier through the "mixer" to act as the error signal mentioned above.

There are two general types of servo amplifiers, the *continuous-control* type and the *relay* type. Where it is necessary to control position to within a quarter of a degree or less, the former, which powers the motor directly, is indicated. Where an error of a few degrees can be tolerated, the relay type is satisfactory and much simpler.

As even a "sharp" rotary antenna seldom has a main lobe narrower than thirty degrees, a relay-type amplifier is the common choice, especially because any conventional rotator may be controlled with it.

A Practical Servo-system

Figure 3 and the photographs illustrate the beam-control system used at W2JKH. All parts, except the autosyns and the aircraft controller, which is used as the rotator, are standard, catalogue items. These parts are *surplus,* but are still available from several sources at reasonable prices.*

Actually, the rotator is not an essential part of the servo-system. Any standard rotator could be used, but this one is both economical and compact. Although a midget compared to a "prop-pitch" motor, it turns my three-element, 14-Mc. beam with its nineteen-foot boom without difficulty.

Other Syncros may be substituted for those specified, but may require some modification of the amplifier input circuit.

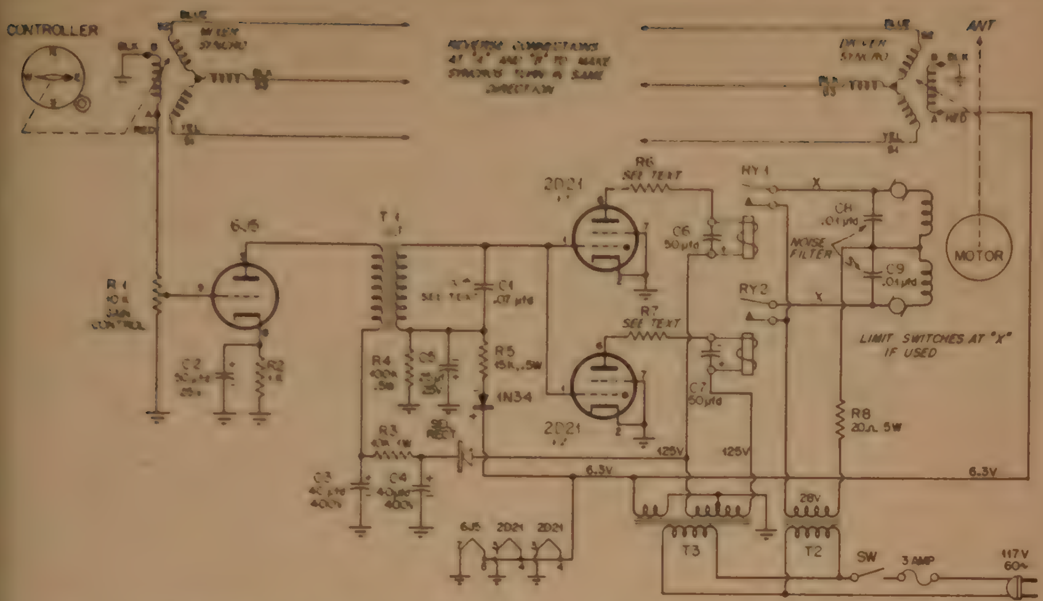
The Amplifier

I have waited until the actual diagram was introduced to discuss the amplifier. Only the operation of the 2D21 thyratrons can be considered in the least mysterious. Their grids are connected in parallel and biased to plate-current cut off. The a-c error signal is fed to them through *T1*. A-c plate voltage is fed to the 2D21's in push-pull through the relay windings.

An error signal at the grids of sufficient amplitude and in phase with the plate voltage on one of the thyratrons will ionize the gas in it. This immediately reduces its plate resistance to a very-low value, and a large plate current flows, causing the relay to close and apply power to the rotator.

Once a thyratron "fires" its grid loses all control of the plate current as long as the plate voltage is positive and sufficient (10-15 volts) to maintain ionization in the tube, because the ionic bombardment of the grid neutralizes the effect of any external grid excitation. In this application, however, the a-c plate voltage auto-

* The reversible series motor, AYLC 1591 Aircraft Controller is readily available from surplus houses at this writing. The Synchros could be 26-volt, 400-cycle, Eclipse-Pioneer autosyns which are also commonly available. Editor.



C1—0.05 to 0.1 µfd., line-phasing compensating condenser.
C2—50 µfd., 25v., electrolytic.
C3, C4—40 µfd., 400v., electrolytic.
C5—25 µfd., 25v. electrolytic.
C6, C7—50 µfd., 150v., electrolytic.
C8, C9—0.01 µfd., disc ceramics.
R1—10,000-ohm potentiometer.
R2—1000 ohms, ½w.
R3—10,000 ohms, 1w.
R4—100,000 ohms, ½w.
R5—15,000 ohms, ½w.
R6, R7—2 watt resistors to match Ry1 and Ry2. See text.
R8—20 ohms, 5w.
Ry1, Ry2—Single-pole, normally open relays. 3-amp. contacts. Most plate circuit relays will work at this position with the proper selection of R6 and R7.
Sel. Rect.—Half-wave selenium rectifier.
T1—3:1 ratio audio transformer.
T2—28v., 3-amp. transformer with 117v. primary. Super Electric Products ST-189, or equivalent.
T3—6.3v, 1-amp. transformer with 250v. c.t. secondary at 25 ma. Stancor PS-8416, or equvalent.
1N34—crystal diode.

Fig. 3. Wiring schematic and parts list for the servo amplifier.

matically de-ionizes the tube on each negative half cycle. It will re-ionize on the positive half cycles, only if the excitation voltage is still present on the grid.

At first glance, it would seem that both thyratrons will fire when an error signal appears on the grids, because they are connected in parallel. But remember that the plate voltage is a.c., and the plates are in push-pull. As a result, when one plate is positive, the other one is negative. For a tube to fire the instantaneous voltage on *both* the plate and grid must be positive. While on the next half cycle, the other plate goes positive, the grid signal is then negative. Result: the tube cannot fire.

Whether *V1* or *V2* fires depends upon which way the Syncros are displaced from the null position.

Thyratrons are used as the control tubes, because the error signal triggers the plate current "on" and "off," without varying it over wide limits as would occur with vacuum tubes. This is an obvious advantage in relay operation.

There are two possibilities of the thyratrons mis-firing. One is a phase difference between the instantaneous plate and grid voltages. A shift of ninety degrees, for example, will permit both tubes to fire if the amplitude of the grid voltage is sufficient. Smaller phase errors will have the same tendency to a lesser extent. The Syncros can introduce a phase shift up to thirty degrees, which, fortunately, is easily corrected. This is the function of *C1*.

The second possibilty of the thyratrons misfiring is excess resistance in the grid circuit. The ionic bombardment of the grids mentioned earlier builds up a charge. This charge leaks off during the negative half cycles of plate voltage. But if there is too much resistance in the grid circuit, all the charge will not leak off before the next positive half cycle of plate voltage arrives, and the tubes will ionize in the absence of an error signal. With the values shown, however, no trouble from this effect should be experienced.

Construction and Adjustment

All components in *Fig. 3* are located at the base of the antenna, with the exception of the *Controller* and the power switch. A seven-conductor control cable connects them to the *Controller* and switch at the operating position.

Almost any arrangement of the parts in the amplifier will be satisfactory. A selenium rectifier and its associated filter supplies d-c plate voltage for the 6J5 from the thyratron plate transformer. A 1N34 and filter biases the 2D21's from the filament winding.

Ry1 and *Ry2* are single-pole, normally-open relays. They must be capable of handling three amperes and sensitive enough to operate on 100

The system described in the text easily rotates this three-element array on a nineteen-foot boom.

milliamperes (the maximum plate-current rating of the 2D21's) or less. *R6* and *R7* limit the current to the desired value. 1,000 ohms permits about forty milliamperes to flow. The 50-μfd condensers across the relay coils eliminate contact chatter and the .01-μfd condensers across the motor leads eliminate brush noise.

The 24-volt, 400-cycle Autosyns work excellently on sixty cycles if the voltage is held to six or seven volts. I used a pair of one-to-one ratio gears to couple the driver Syncro to the beam drive shaft.

After the amplifier is wired, the next step is to adjust *C1* to compensate for phase shifts introduced into the system. The easiest way is with the aid of an oscilloscope. Connect the vertical amplifier to the 2D21 grids and the horizontal amplifier to one of the plates. The resulting trace on the cathode-ray tube will be a diagonal straight line when *C1* is correct. It will slant to the right or the left depending upon which plate is chosen, and which direction the *controller* Syncro is displaced to generate the error signal.

Incidentally, the scale and case for the controller may be a revamped *surplus* position indicator, or it may be constructed with a pointer on the Syncro rotor and a dial scale. Put enough friction on the pointer to hold it in position once it is set.

After *C1* is adjusted, the amplifier gain must be set to match the output of the *Mixer* Syncro and the amount of coasting in the beam when power is removed from the motor. This is necessary for this reason: suppose the beam coasts five degrees. Also suppose that the amplifier gain is high enough; so that a position error of a degree or two is sufficient to fire the thyratrons. As the antenna rotates, the error signal is reduced to zero when the antenna approaches the desired position and the relay opens, removing power from the motor. However, the antenna will coast beyond this point, producing an error signal of the opposite polarity. The other thyratron fires and closes the other relay, applyin reverse current to the motor. The antenn comes to a shuddering stop and starts back the opposite direction—*if nothing breaks.* Th cycle may be repeated indefinitely as the syste "hunts" for the null. Do not underestimate th strain it places on the motor, gears, and antenn even at a speed as low as one r.p.m.

To check the system for "hunting," put piece of paper between one set of relay co tacts, and turn the *controller* to close the oth relay. Carefully watch, as the antenna zeros i to see if there is enough play or coasting to pe mit the second relay to close after the first on opens. The paper between its contacts will pr vent possible damage during the test.

Amplifier gain can always be reduced su ficiently to eliminate "hunting," but it is d sirable to keep it reasonably high to permit mo accurate antenna positioning. If all coastin and "play" were eliminated, accuracies of abo one degree would be possible.

With a full twenty-eight volts on the dri motor, the AYLC 1591 rotated my antenna two r.p.m., which resulted in quite a bit coasting. Adding *R8* reduced the speed to abo one r.p.m. and coasting to about five degree By proper adjustment of *R1*, the relays open the antenna approaches the desired positio and it coasts right on the nose.

There are at least three ways to make th position shown on the *controller* agree with th actual position of the antenna. One is to allo the antenna to assume a position, loosen th clamp holding the *controller* case, turn the cas and allow the beam to null again, repeatin until the *controller* and antenna position agre The second is to loosen the *controller* setscre and turn the pointer or dial to position, whi holding the rotor. Then retighten the setscre A third is to disengage the *driver* gear from th one on the antenna drive shaft, pull out th 2D21's, and manually close one of the rela until the antenna position corresponds with th on the *controller*. Re-engage the gears and r place the tubes.

A Word of Caution

A servo-controlled rotator will always tu the antenna in the direction requiring the le angular motion to produce a null in the err system. For example, if the antenna is pointi north, and you desire it to point east, it will tu clockwise ninety degrees to reach the new po tion, whether the *controller* is turned ninety d grees in the clockwise direction or 270 regre in the counter-clockwise direction. In an a tenna installation with unlimited rotation, t entails no special problems. However, wh feeders limit rotation, it could result in troub

A stop on the *controller* to limit its rotati to 360 degrees will eliminate almost all dan of twisting up the feeders. Not quite all, ho ever. As explained above, if the *controller*

(Continued on page 58)

Putting the BC-625 on 220 Mc.

LEROY W. MAY, JR., W5AJG

9428 Hobart Street, Dallas 18, Texas

In Answer to Many Requests on How to Fire Up on 220 Mc. We are Pleased to Present this Conversion Article on the SCR-522 Transmitter Unit

The transmitter unit of the SCR-522 (BC-625) has added another conquest to its already long list of achievements. No doubt, it has been used in one form or another on all amateur bands from 160 meters on down to 2 meters. With the growing popularity of the 1¼ meter band, it is only natural that it would, sooner or later, move into that band.

Just as on all the other bands involved, there are probably many different ways to make this transmitter work satisfactorily on 220 Mc. The method to be outlined is one that has worked nicely and the output after conversion to 220 Mc. is approximately the same as when used in its natural state on 144 Mc. All meter readings should run just about what they do on 2 meters.

The Oscillator Stage

This stage originally is equipped with a type 6G6G tube (VT-198A) with the grid circuit operating in the 8-Mc. band and doubling in the plate circuit to 16 Mc. Before going further, and to refresh the memory, the original oscillator tube drives a type 12A6 which triples to 48 Mc. and in turn drives the first 832A tripler to 144 Mc. The last 832A in the unit is an amplifier, operating straight through on 144 Mc.

It is desirable to keep the last 832A operating as a straight-through amplifier on 220 Mc. if at all possible, so as to make the output on 1¼ meters the same as on 2 meters. This condition was met with no difficulty.

Therefore, the new line up will be 3 x 3 x 3 plus the straight-through final, instead of the original 2 x 3 x 3 and the straight-through final. The same series of 8-Mc. Crystals may be used. These will be in the frequency range 8144 kc. to 8333 kc. which will represent the limits of the 220-225 Mc. assignment.

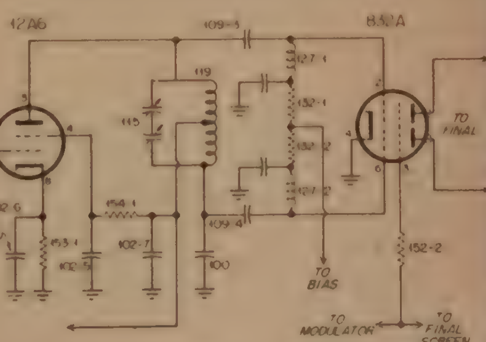
Now back to the oscillator stage. Several tubes and circuits were tried in this stage and nothing at all was gained over the original tube, so the 6G6G was replaced and used. The changes that are necessary in circuitry of the oscillator-tripler stage are these:

1. Since the plate circuit will now triple to 24 Mc., it becomes necessary to remove 4 turns from the cold end of the plate inductor *(118)*. The grid dip meter should now show that the circuit tunes through 24 Mc. No change is made in the plate tuning condenser *(114)*.

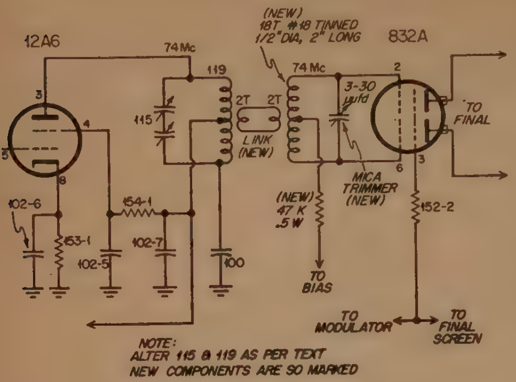
Numbers used indicate the designation given by the Army to the various components of the BC-625 transmitter.

The 12A6 Stage

This is the second tube in the r.f. string and is again used as the first tripler, taking the 24 Mc. oscillator output and multiplying to 74 Mc. It is possible that other later and "hotter" tubes



Original circuit of the 1st and 2nd harmonic amplifiers in the BC-625 transmitter.



Modified tripler stages in the BC-625.

might work better in this stage but not too much was done along these lines. The old original 12A6 tube will triple and deliver ample drive to the next stage after a few modifications. Right now it is necessary to scale down the plate condenser and coil of this 12A6 tripler stage as follows:

2. Remove three turns from each end of the plate coil *(119)* and remove and discard the form on which the coil is originally wound. This will leave an air wound coil and the spacing should be adjusted so that the overall length of the coil is 1⅝ inches.

   The plate condenser *(116)* should be altered so that 4 rotor and 4 stator plates are all that is left. This means removing 2 stator plates and 3 rotor plates.

A word about this plate removing operation. It is not necessary to remove the condensers at all. A pair of long needle-nose pliers and a little judicious wiggling and pulling will get the job done easily. After the first couple of plates have been pulled, the technique becomes simple. The grid-dipper should show resonance in this stage at 74 Mc.

The First 832 Stage

So far, we have been dealing with rather low frequencies (to a v-h-f man). Now the first 832A stage will become a tripler from 74 Mc. to 220 Mc. which is our final frequency. At this point an experiment is suggested. First off, leave the grid circuit of this first 832A stage as is, namely capacity coupled to the preceding 12A6 tripler. If the 832A is receiving ample excitation, there is no point in changing the input grid circuit. As most all owners of 522's have learned, these things look just alike, but do not always work exactly alike. Some are just naturally "hotter" for some reason. Here at W5AJG we felt that the grid of the first 832A stage was just a little low on excitation for best tripling efficiency, so we discarded the capacity coupling from the preceding stage and put in link coupling.

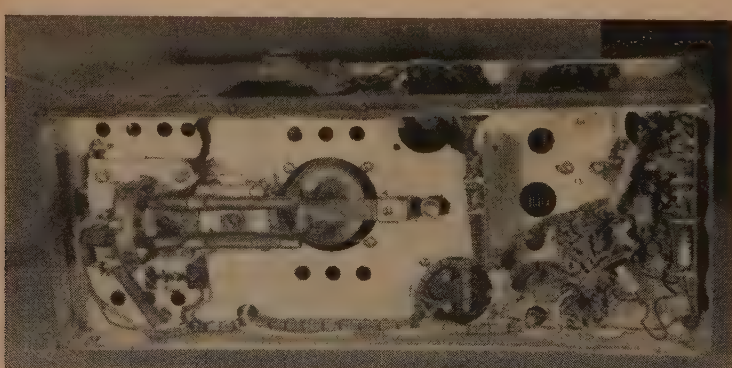
This will necessitate a new grid tank for the 832A input circuit resonating at 74 Mc. but plenty of room is available and it can be made up and installed in a few minutes. Upon installing this new circuit, it was found that the excitation had increased sufficiently for good tripling efficiency. The new coil is made as follows:

3. On a ½ inch diameter form, wind 18 turns of No. 18 tinned solid bus wire. Remove the form and adjust spacing until the overall length is 2 inches.

The coil is tapped in the middle and a new 4000-ohm ½-watt grid resistor is fed in at this point. The coil is mounted directly to the grid lugs of the 832A socket and a 3-30 μμfd. mica compression trimmer is wired with stiff wire in parallel with the coil. It may be adjusted from the top of the set. A link of two turns at either end is made of insulated hookup wire and feeds from the 12A6 plate coil to the center of the new coil. When using this modification in the grid circuit of the first 832A, the components comprising the capacity coupling setup can be removed and discarded. These are:

4. Coupling condensers *109-3* and *109-4*
   R-F chokes, *127-1* and *127-2.*
   Grid resistors, *132-1* and *132-2.*
   Bypasses, *102-8* and *102-9.*

The plate circuit of the first 832A tripler requires complete modification and the same will



This view shows the output of the first 832A stage and the input circuit of the final 832A amplifier. Both circuits operate on 220 Mc. and are link coupled with a piece of hookup wire shaped in the form of a closed hairpin.

hold for the grid and plate circuits of the final 832A amplifier. These circuits are now operating at 220 Mc and the inductors will take the form of lines and hairpins.

In the plate circuit of the first 832A tripler stage the changes will be these:

5. Remove 4 rotor plates from the plate tank condenser *(116)*. This will leave only 1 rotor plate in use. Remove and discard the following parts associated with the output of the tube:
   Plate tank coil *(120)*. This is actually 2 wires in the form of a line.
   Coupling condensers, *109-1* and *109-2*.
   R-F Chokes, *127-3* and *127-4*.
   Bypasses, *102-12* and *102-13*.

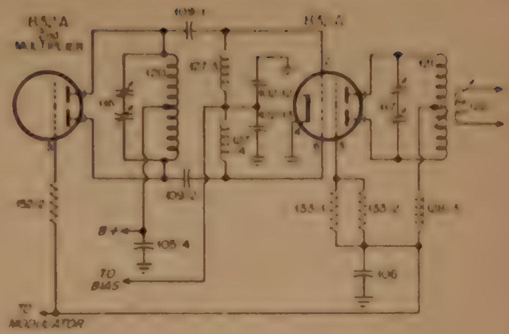
See the photograph showing the layout in the new form of the output of tht first 832A and the input of the 832A straight through amplifier. Construct the new inductors you see as follows:

6. For the plate output inductor of the first 832A use shorted section of line composed of ¼ inch copper tubing spaced 1 inch center to center and 4¼ inches long.

Again referring to the photo, mount this line by two pieces of copper strap to the tank condenser *(120)* and out about ½ inch from it. This actually places the tuning condenser of the 832A back about three inches from the hot end of the lines. Right at the hot end of the lines and for connection to the plate pins of the tubes, a couple of pieces of soft copper strip about ¼ inch wide are soldered to the tube connectors, which will be clipped to the plate pins of the 832A tube.

Final 832A Amplifier

Continuing on to the grid circuit of the 832A final, it is seen that a new grid input inductor is used. This consists of a hairpin shaped piece of copper strap going from grid lug to grid lug on the tube socket. It is made of a piece of material of about *0.015″* thickness, ⅜-inch wide and 5 inches long. It is bent into shape and at the base is 2 inches wide, just the same spacing as the grid lugs on the 832A socket.



Original circuitry of the 832A final amplifier.

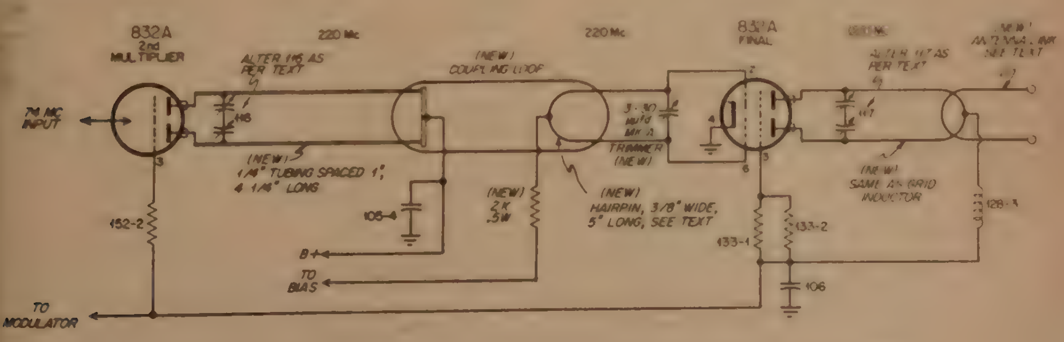
Also in parallel with the loop at this point is another 3-30 μμfd. mica compression trimmer condenser. The grid resistor for the final grid is that normally used as well as an additional 2000-ohm ½-watt resistor soldered at the electrical center of the hairpin.

Coupling between the hairpin and the previously described lines is obtained by forming a piece of insulated hookup wire around the two tank circuits. A little experimentation will produce the maximum grid current to the final.

As to the plate circuit of the final 832A amplifier, use is again made of another copper strap hairpin loop identical to the one just described for the grid circuit. This inductor is soldered on the final tank condenser *(117)*. The original inductor *(121)* is discarded as well as the antenna coupling loop *(122)*. A one-turn loop is used for the antenna pickup and this new loop is soldered to the antenna receptacle formerly holding the variable coupling link. The tank condenser *(117)* is again altered using the same technique for removing 4 rotor plates. This leaves only one rotor plate in use. All circuits associated with the last 832A stage should now grid dip to 220 Mc.

The plate condenser of the final stage has soldered to it two copper strips as previously described to engage the plate pins of the tube. Do not use the original flexible braided wires

(Continued on page 57)



Modified 832A final amplifier showing the loops and coupling links to put it 220 Mc.

A Four-Band DX Antenna

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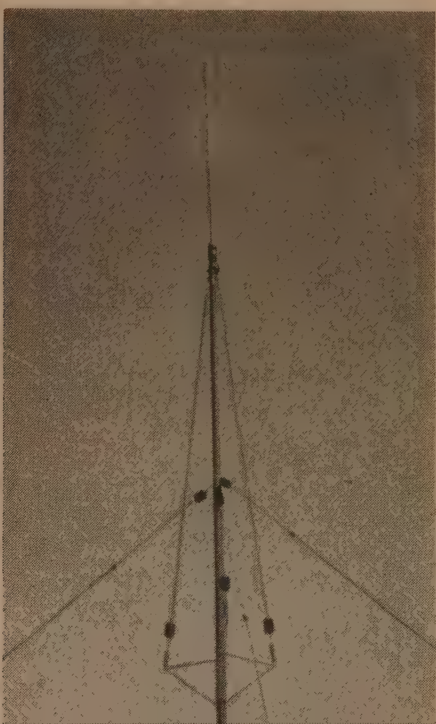
Thought Provoking Design of a Vertical Radiator with Details of its Evolution and Construction

Do you have but little space for antennas? Do you want to be able to work four bands with one antenna? Do you have TVI troubles? Do you covet that *S9 Plus* report from half-way around the world? If you do, read on, for here is a reasonable and sensible answer to your wishes. If you aren't interested in any of these things, read on anyway, because here is an idea that you and the boys in your net can kick around a bit during "ragchews."

The antenna described here is a vertical radiator or perhaps we should say it is a combination of two vertical radiators. Looking back on our days in radio broadcast engineering, we remembered that a vertical radiator of the proper height is excellent for low-angle radiation. By reference to textbooks and past experience, we know that a height of 0.58 wavelength for our vertical radiator gives us the most low-angle radiation for our money. The calculated vertical radiation pattern for a 0.58 wavelength vertical radiator is shown in *Fig 1a.* Inasmuch as the length of an antenna in wavelengths varies directly as the frequency, we can select a length which will be 0.58 wavelengths at the highest frequency we wish to use.



With the advent of the 21-Mc. band, and the more recent opening of it to phone operation, we were faced with the problem of selecting an antenna system which would work on four bands. We have neglected 28 Mc., because it is not going to be a very useful band to us for the next few years due to the trend of the sunspot cycle. We had been getting very good results with a drooping ground plane vertical radiator on 21 Mc., so the thought hit us, "Why not put it on top of our vertical radiator?", thus solving the problem as far as 21 Mc. was concerned.

Radiation Patterns

That left us 14, 7 and 3.9 Mc. still to be accounted for. So we then selected a *total antenna length of 39 feet* as being 0.58 wavelengths at 14 Mc. This length includes the 11-foot 21-Mc. drooping ground plane's whip. A length of 39 feet becomes 0.30 wavelengths at 7 Mc., and 0.16 wavelengths at 3.9 Mc. These are reasonable lengths for the lower frequencies. The calculated radiation patterns for 0.30 and 0.16 wavelength vertical radiators are shown in *Figs. 1b* and *1c.* As inspection of these curves will show, we are still able to get good low-angle radiation from our vertical at these frequencies.

Constructional details of the antenna are shown in *Fig. 2.* The mast is made from 2″ aluminum tubing. It rests upon a large and rugged standoff insulator, and is guyed at a point 20 feet from the ground, in three directions. The guys are broken up by "egg" insulators, so that no portion of any guy is as long as 11 feet.

The vertical radiator when the author was at W4RXO. The total over-all height is only thirty-nine feet. Three drooping radials are used on 21 Mc., and a ground screen on all other bands.

The fitting which holds the 21 Mc whip at the top of the 2" mast is a surplus type *MP-48* whip base insulator, complete with spring. It provides a means for fastening the coaxial feed line internally. The whip is made of surplus *MS53*, *MS52*, *MS51* and *MS50* whip sections, with the last section cut to give an overall whip length above the base insulator of 11 feet. A machined fitting holds the base of the *MP-48* whip base tightly inside the top of the 2" mast. The drooping ground plane radiator is fed by means of *RG-8/U* coaxial line which goes down through the mast, and which terminates in an

Fig. 2. Construction details of the 4-Band antenna. Only one radial has been shown in this drawing for the purpose of clarity.

SO-239 chassis type female connector set into the mast just above the base insulator. The outer conductor of this line is thus connected to the mast at top and bottom.

The three drooping ground plane radials are mechanically fastened to the *MP-48* whip base by means of three small "egg" insulators, and are electrically connected to the *MP-48* base at only one place, which is a bolt in the side of the "ground" portion of the *MP-48* base, above the spring. The length of each radial is exactly 11

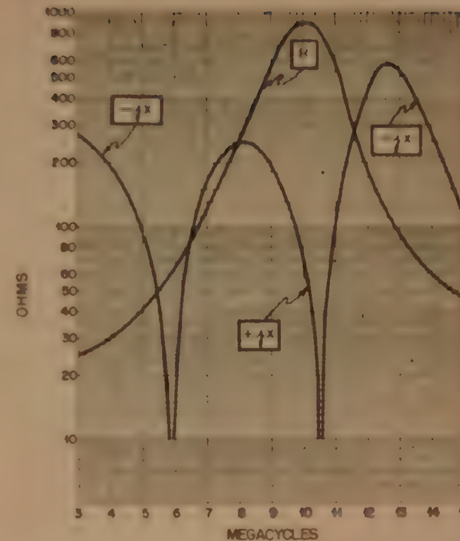


Fig. 3. Measured radiation resistance and reactance of the 4-Band antenna. The method of matching was developed after these measurements had been made.

feet, measured from this bolt. The bottom ends of the radials are secured to large "egg" insulators, which are fastened to brackets which hold the bottom ends of the radials a distance of 1 foot out from the mast.

At this point you are probably beginning to wonder how the 11-foot whip at the top of the mast is made to act as extension of the mast, and to radiate, at the three lower frequencies. Well, take a look at *Fig. 2*, and you will see that we have used a 7-foot 6-inch piece of *RG-8/U* coaxial line as a shorted quarter-wave stub cut for 21 Mc., the open end of which is connected between the whip and the drooping ground plane. The outer braid of the stub line is connected to the mast at several places along its length. The connection between inner conductor, outer braid, and mast itself, at the lower end of the stub, serves to effectively connect the whip to the mast at the three lower frequencies. This would not be true, of course, if the stub were insulated from the mast.

The Matching Network

Now, the question of feeding power to this antenna at four different frequencies arose.

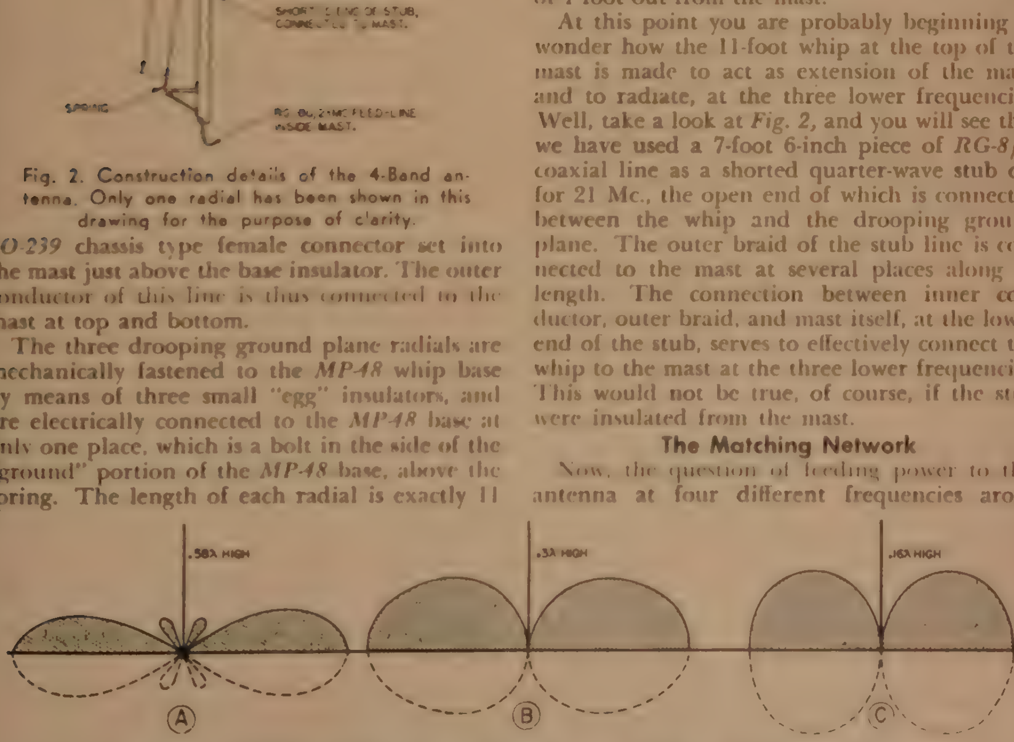


Fig. 1. Theoretical vertical radiation patterns. The antenna is considered to be 0.58 wavelength on 20 meters, 0.30 wavelength on 40 meters and 0.16 wavelength on 75 meters. Radiation on all of these bands is at the most favorable angles.

Base and tuning unit at W4RXO. The two-inch diameter aluminum tubing rests on a surplus insulator.

Obviously, we needed some sort of matching system between the base of the mast and our *RG-8/U* transmission line for our three lower frequencies, and we also had to feed 21-Mc. power to the drooping ground plane radiator at the top of the mast.

The first step was to measure the radiation resistance and reactance of the antenna at 3.9, 7, and 14 Mc., with a *General Radio Model 916A* r-f bridge. In order to get the complete picture, we took measurements at one megacycle intervals from 3 to 15 megacycles, and the results are plotted in *Fig. 3*.

The base impedance of our antenna at the three lower frequencies is shown in this table:

	R	*X*
3.9 Mc.	30	−j200
7.25 Mc.	135	+j190
14.25 Mc.	59	−j195

These three impedances can be matched to our 52-ohm line by a network such as the one shown in *Fig. 4*. At 3.9 Mc. the large inductance is used as a tapped loading coil. The exact size of the coil can be calculated, using an inductive reactance of 200 ohms at 3.9 Mc., which is required to balance out the 200-ohm capacitive reactance of the antenna. The position of the tap can be determined easily by experiment. A 14 Mc., the tap on the coil is at a higher pos tion. At 7 Mc., we have a simple *L*-networ with the series capacity in the feedline to ba ance out the inductive reactance of the an tenna at this frequency. Adjustment of th 14-Mc. tap, and the setting of the variable con denser for 7 Mc., may be easily done by trial.

How did we feed the 21-Mc. power to the co axial line up the mast? No, we didn't just plu it in when we wanted to go on 21 Mc. W *wound the large coil out of coaxial line,* and fe the 21-Mc. power through this line, and use coaxial line from the coil to the base of the mas as the lead-in for the three lower frequencie Take a look at the sketch, *Fig. 5*, and at th photographs, and you will see how this was done

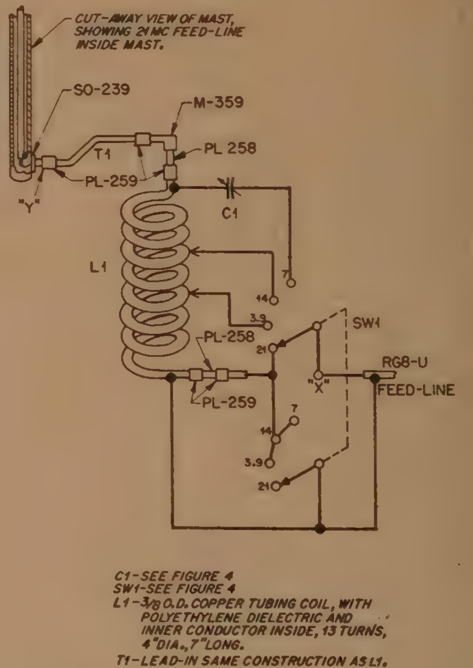


Fig. 5. Construction details of the matching network.

Where did we get our copper coaxial line? Wh we made it! It was very easy. We took 15 fee of *RG-8/U*, stripped the vinyl covering an outer copper braid from it, thus leaving th polyethylene dielectric and the inner conducto We then slipped this into a 15-foot length o ⅜" O.D. copper tubing, where it fits very nicel making our required length of copper coaxi line, and we wound it into an inductance of th proper size. A *PL-259* coaxial male plug w soldered on each end of the coil, and throug the use of *PL-258* female junction fittings, co nection can be made to the feed-line at eac end of the coil, with *PL-259* plugs. A simila short piece of this home-made copper tubing c axial line was used between coil and mast fittin as the lead-in. We passed it through an *E.*

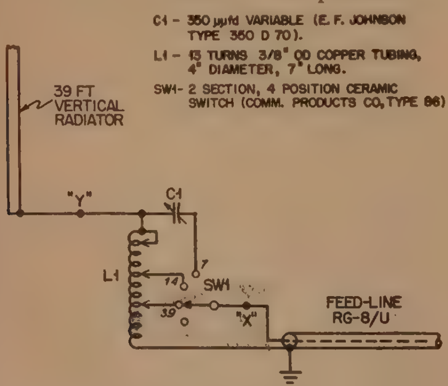


Fig. 4. Schematic of the matching network.

Johnson Type 135-67 insulator before soldering the *PL 259* plugs on the ends. It fits very nicely through the hole in the insulator, after the bolt is removed. After installation, the hole was caulked with rubber cement to make it water proof.

We used one coaxial line for the 21 Mc. and lower frequency feeds from the transmitter. The switching from 3.9 to 7 to 14 to 21 Mc. was done by means of a large rotary switch, as shown in *Fig. 5*. Relays may be installed to do this job by remote control, if desired.

Note that the inner conductor of the coaxial coil *L1* is grounded at 3.9, 7, and 14 Mc., at the ground end of *L1*, through the contacts of *Sw1*.

Ground System

Our tuning unit, built into a waterproof aluminum box, is shown in the photographs. Once adjusted, it is closed up and left alone. The rotary switch shaft projects through the side of the box with a rubber grommet to keep water out. It is turned by using a screwdriver.

An antenna of this kind needs a good ground system. We buried eight radials, of #12 bare copper wire, each 60 feet long. They are all tied together at the base of the antenna, and *one* ground lead is brought up to the tuning unit cabinet. A six-foot square piece of copper ground screen would be a very good addition to this ground system, and some day we intend to put one in. The radials should be soldered to it, as shown in the sketch, *Fig. 6*. Of course, the ground system was installed *before* the resistance and reactance measurements were made!

In tuning up, it was useful to insert a 0-5 ampere line-current r-f ammeter at point "X," and a 0-9 ampere antenna current r-f ammeter at point "Y." The antenna current meter

Fig. 6. The efficiency of this type of antenna depends upon the ground system. This is the suggested arrangement for radials at the base of the antenna.

Fig. 7. This antenna current meter should be inserted at point "Y" in Fig 5 while the antenna is being tuned up.

needed an adapter to enable it to be plugged in between the coaxial lead-in and the connector at the base of the mast. This is shown in *Fig. 7*. For r-f current measurement purposes, the inner and outer conductors of the coaxial lead-in were connected together, as shown. When the system is properly tuned up on any one of the lower frequency bands, the power in the feedline and antenna can be easily computed by Ohm's Law, for the line impedance is 52 ohms, and the radiation resistance of the antenna is known. These two power readings should be equal, and should also be equal to the final amplifier's power input multiplied by a reasonable efficiency figure, of say 70%. In our case our power *output* is approximately 670 watts.

Results

The results obtained with this antenna system on all four bands have been most gratifying. The drooping ground plane gives us very good low-angle radiation on 21 Mc. You may wonder why we "drooped" the radials so much, when the usual practice is to run them out at about 45 degrees from vertical. Well, we wanted to lower our angle of radiation, for one thing. And then, too, we wanted to keep them down alongside the mast so that they would not have a tendency to act as top-loading at the lower frequency bands and thus throw off our antenna height pattern calculations. By installing them as shown, there is a slight mismatch between the *RG-8/U* line and the ground plane antenna, but our standing-wave ratio on the line at 21 Mc. is only in the order of 1.35:1.0, and we did not consider this to be objectionable. We could perhaps eliminate standing waves entirely by making adjustments to the shorted quarter-wave stub, but it's not worth climbing a 2" pipe mast to do it! However, one of our dreams is to some day use a short, triangular tower of the "TV antenna" type as our vertical radiator, and then we'll be able to climb it and make such adjustments.

On 14 Mc. we can notice the difference between this antenna and the usual half-wave doublet or quarter-wave vertical, both of which we had used previously. Overseas signals are much stronger, and there is less "short-skip," or "stateside" QRM, because of the shape of the vertical radiation pattern, shown in *Fig. 1*. On 7 Mc. it performs beautifully, giving us S9 plus reports on almost every contact. On 3.9

(Continued on page 58)

Simplified Pi-Network Solutions

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This is an Easy Approach to Designing Your Own Pi-Networks for Inter-stage or Final Tank Circuits

The pi-network is an integral part of a considerable number of commercial radio transmitters. It is also becoming increasingly popular in home-built rigs. The advantages offered by the pi-network include the ability to match a large variety of antenna impedances to a very wide range of tube loading characteristics. Higher order harmonics may also be attenuated, inter-stage coupling can be effected with less TVI and coaxial cables may be easily fed with assurance that a maximum power transfer is possible.

Numerous articles[1, 2, 3, 4] have presented design information on the pi-network. This article

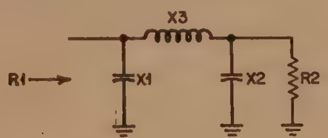


Fig. 1. Pi-network configuration with R1 representing the input load and R2 the output load.

shows a new simplified approach which permits the quick solution of problems involving antenna impedances of from 30 to 1000 ohms and tube loads of from 1500 to 9500 ohms.

Elementary Theory of Problem

To find how this simplified approach may be used refer to *Fig. 1.* In this schematic we see the commonly pictured circuit of the pi-network, where $R2$ is the load resistance (generally presented by the antenna, etc.) and $R1$ is the resistance looking into the pi-network. Note that $X2$ and $R2$ are in parallel and according to Schottland[1] they may be replaced with their series equivalents Xe and Ra. However we may also cancel the series capacitive reactance of Xe through the insertion of some additional inductive reactance, $X4$. Essentially speaking our tank circuit becomes $X3$, $X1$ and Ra (see *Fig. 2*).

The following relationships become apparent where the Q of the circuit is more than 10:

(1). $Q = X3/Ra = R1/X1$
(2). $X3 = X1$
(3). $Ra = R1/Q^2$
(4). $X4 = Xe$

The most difficult part of pi-network calculation now becomes the conversion of $X2$ to its series equivalent Xe.

This conversion is readily accessible if presented in graphical form (see *Fig. 3*). Here we see plotted $Ra/X2$ against $Ra/R2$. For problems where $R1$ and $R2$ are both known, Ra may be calculated from the equation (3) and $X2$ determined from the graph. It is now only necessary to calculate the ratio $Ra/R2$ and enter the graph along the horizontal axis at this value, read $Ra/X2$ from which $X2$ may be found.

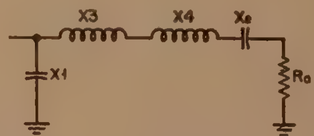


Fig. 2. As shown in Fig. 1 the reactance X2 and the load R2 are in parallel and may be replaced by their series equivalents Xe and Ra. Additional inductance X4 cancels the capacitive reactance of Xe.

Thus, a complete family of curves is unnecessary (involving $R2$, Ra and $X2$) and in addition, since $Ra/X2$ equals $Xe/R2$, the value of Xe may also be calculated.

1. Schottland, "Pi-Networks as Coupled Tank Circuits," ELECTRONICS, April, 1944.
2. Pappenfus and Klippel, "Pi-Network Tank Circuits," CQ, September, 1950, p. 26.
3. Whalley, "The Design of Pi-Network Tank Circuits," R.S.G.B. Bulletin, April, 1952, p. 439.
4. Technical Topics, QST, April, 1952, p.

Working Example

Assume that we want to design a pi-network that will match a quarter-wave whip antenna with a radiation resistance of 35 ohms to a tube running 600 volts at 100 ma input. To a good approximation the tube will want to see the following load

$R1 = 500\ E/I$

$R1 = 500\ (600/100)$

$R1 = 3000$

So the problem becomes one of matching 35 ohms ($R2$) to 3000 ohms ($R1$). As a result, if we assume a Q of 10 or more, using equation (3)

$Ra = R1/Q^2$

$Ra = 3000/100$

$Ra = 30$ ohms

and the ratio

$Ra/R2 = 30/35$

$Ra/R2 = 0.86$

and from *Fig. 3*

$Ra/X2 = Xe/R2$

$Ra/X2 = 0.35$

from which

$Xe = 12.2$ ohms and $X2 = 86$ ohms.

Equation (1) may be rewritten

$X1 = R1/Q$

$X1 = 3000/10$

$X1 = 30$

therefore

$X3 = 300$ ohms

$X4 = 12.2$ ohms

and the total

$XL = X3 + X4 = 300 + 12.2 = 312.2$ ohms.

The circuit now appears as shown in *Fig. 4*. From this point the values of the necessary capacitances and inductances may be obtained

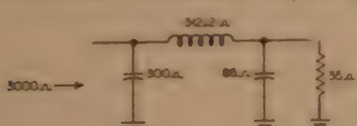


Fig. 4. Load and reactances obtained through solution of sample problem involving a quarter-wave whip antenna and a 3000-ohm plate load.

from the usual charts available in determining reactances for the particular frequency in use.

The value of 300 ohms reactance at $X1$ may be difficult to obtain. At 10 meters this is a total capacitance of approximately 18 $\mu\mu$fd. and would consist of the tube output capacitance, wiring capacitance and the minimum value of the tuning capacitor. If difficulty is experienced the solution lies in a lower E/I ratio, or in an increase in the Q of the circuit.

The problem of matching a tube to a following grid circuit is somewhat different, as the grid circuit impedance is usually higher than the tube will want to see. Note that we can reverse the input and output values shown in *Fig. 4* and make the circuit look the other way around. Thus for matching into a higher impedance from a lower one we turn the network end-for-end.

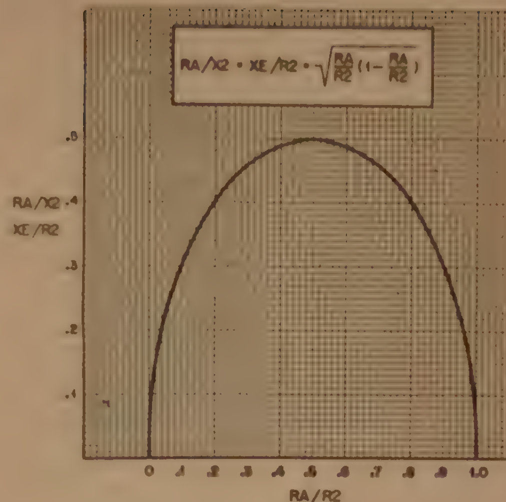


Fig. 3. This graph enables the easy conversion of X2 to its series equivalent Xe.

For practical purposes the grid circuit impedance is given by the approximation

$R = 600{,}000\ (P/I^2)$

where P is the grid driving power and I is the d-c grid current in milliamperes (obtained from a tube manual).

For a single 807

$R = 600{,}000\ (0.4/4^2) = 15{,}000$

If the driver tube is running at about 250 volts and 60 ma. the plate load should be

$R1 = 500\ (250/60) = 2080$ ohms

Looking from the grid back toward the plate, the circuit becomes as shown in *Fig. 5*. To reduce harmonics the Q must be kept fairly high but circulating currents should be kept reasonably low. A Q of 20 is recommended as a compromise.

Therefore

$Ra = 15{,}000/400 = 37.5$ ohms

$Ra/R2 = 37.5/2080 = 0.018$

$X1 = 15{,}000/20 = 750$ ohms

The ratio $Ra/R2$ cannot be read accurately

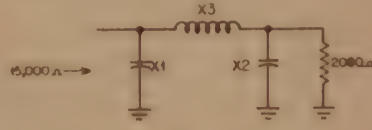


Fig. 5. Parameters for solution of the second sample problem. Note that the pi-network has not been turned end-for-end.

on *Fig. 3*, but when $Ra/R2$ is very much less than unity

$X2 = Xe = (RaR2)^{1/2}$

Thus,

$X2 = Xe = (37.5 \times 2080)^{1/2} = 289$ ohms

The circuit is now shown in *Fig. 6* with approximate reversal.

(Continued on page 66)

Easter Island Expedition

LUIS M. DESMARAS, CE3AG, CEØAA
as told to Dick Spenceley, KV4AA

Casilla 761, Santiago, Chile

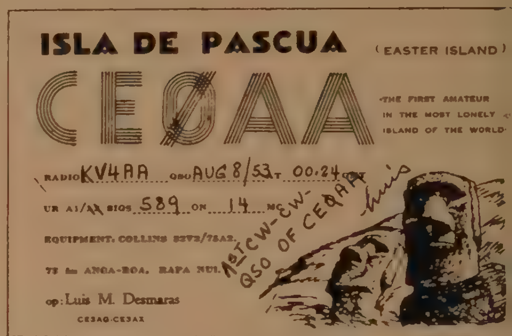
At noon, August 7, 1953, I landed on Easter Island with my Ham equipment. This climaxed a three year fight to operate an amateur station from this rare spot. Fours hours later and for the first time in history amateur signals were emanating from Easter Island under the call of CEØAA.

First contacts were made on phone with my friends CE3AB, CE3AG, CE3OA and CE2CC, all of whom had been diligently tuning around 14,100 kc., day and night, awaiting my appearance on the ether.

Before telling of operations, however, this story would not be complete without mentioning some of the difficulties encountered before this expedition became an actual fact.

Since 1950 I had been determined to put Easter Island on the air. Each time the yearly trip was announced I approached officials who could authorize my passage but this always resulted in a polite "brush off" as passenger accommodations on this ship are practically nil and all available space taken up with indispensable cargo such as foodstuffs, mail and other necessary items. Return trips carry produce of the Island back to Chile. One of the principal items is wool.

Towards the end of 1952 I had been lucky enough to acquire some friends who were in a position to influence my request for passage and, in that way, I was able to announce my trip which I was advised would take place some time in December, January or February. This trip



A very welcome addition to any shack!!

failed due to a decision of the government t
change the administrative system of the islan
which, for most part, had been governed by a
agricultural company for the past twenty year
This contract was terminated in December 195
and the Government started to assemble variou
technicians to visit the island and render
report for future planning.

The Chilean Under-Secretary of the Navy an
Engineer of Radio Communication, Comman
er Angle C. Lira, took charge of all operation
and with a sympathetic understanding regardin
the desires of amateur radio operators, put h
o.k. to my application. Unfortunately the limi
ed accommodations available precluded Arno
do, CE3CZ, who had planned to accompany m

In March, 1953 notice was given to all co
cerned that the Naval Transport "ANGAMOS
would be leaving Valparaiso on April 10. Lat
another notice was received advising that t
trip would be postponed until the end of Ma
As you know, we did not leave in May, or Jun
but finally got underway on the 24th of Jul
This date is near the middle of Winter in t
Southern Hemisphere and this fact did not ad
to our comfort. After a two day stop at Juan Fe
nandez Island, better known as Robinso
Crusoe's Island, where passengers and suppli
were dropped, we proceeded on our way. Se
eral days before reaching Easter the 4,500-to
"ANGAMOS" was buffeted by terrific winds an
high seas which we grimly endured.

It was my intention to put CEØAA/MM o
the air during this voyage, but fearing somethi

Operating position at CEØAA showing the OM hard at work.

would go wrong with the equipment, which would nullify all my past efforts. I spent my time zealously guarding the transmitter which was lodged in a special baggage compartment.

Concerning Easter Island

Now a brief word about Easter Island itself. This island, with an area of 65 square miles, is well known for its mysterious stone monuments or "moais" built thousands of years ago by a now extinct race. There are about 800 inhabitants of which twenty are white and the rest are of Polynesian origin. The natives are extremely kind, affectionate and hospitable. They are strongly built and of good intelligence. They speak the Rapa-Nui language but the majority are familiar with Spanish.

Upon sighting Easter we were forced to circle the island for 36 hours waiting for the wind to subside and the seas to calm sufficiently to permit before a landing to be made. This reduced me to a nervous wreck as it was impossible to get any sleep a condition which was certainly not conducive to the Ham radio operation that followed. The landing was eventually made and in a few hours I had set up the transmitter, receiver and electric plant at the house of my friend, Urbano, as previously arranged. A multiband antenna, 66 feet long, was put up with one end thirty feet high and the other fifteen. After checking everything for proper operation I tuned on 14,100 kc. and, with great emotion, heard the signals of CE3AB, CE3AG and others who were standing by.

First Contact

At 2308 GMT (1608 local time), August 7th, I called CE3AB and immediately established contact for the first QSO from Easter Island. Contact with my own station, CE3AG, operated by CE3DG, followed and I was able to speak with my family and assure them that all was well. QSO's with CE2CC, CE3MJ, PY3DZ, CP5EK and LU7TA followed in quick succession. I had been on the air barely forty minutes when, to my surprise, I heard CW signals calling me. Among them I was able to identify W6GDJ whom I came back to, on phone, for the first W contact at 2349 GMT. A QSO with W6RW followed and then I hooked PAØUN for the

Start of the expedition: Luis follows the transmitter up the gangway.

Luis by the side of Hotumatua monument. According to legend, Hotumatua was the founder of the race actually living on the Island.

first European contact. Next, W2AGW came through for the first phone-to-CW W2 contact. Later I learned that these CW calls were a result of a QST by CE3DG on 14,005 kc. informing the gang of my whereabouts. At 0024 GMT I tuned the 32V-2 to 14,001 kc. and, with great satisfaction, contacted KV4AA for the first CW to CW QSO. This was rapidly followed by contacts with W6SAI and K2EDL (ex-W6IBD). In that way I had started the CW ball rolling and there was very little rest for me from then on.

Ten minutes on this frequency had precipitated an avalanche of W calls with all signals between 579 and 599.

After eight hours of operation 165 contacts had been made and every W district had been worked. First contacts in each district were as follows: W1RY, W2AGW, W3EVW, W4CEN, W5NW, W6GDJ, W7PGX, W8WZ, W9NDA and WØNWX. At that point the need for sleep overcome me and I QSB'd into a much needed rest.

The next days of operation resulted in 271 contacts on CW and phone with North America, South America, Europe and Oceania. Conditions favored ZL and VK contacts on 3.5 and 7 Mc. and many were made.

The Record of QSO's

Nothing short of remarkable were the propagation conditions existing between CEØAA and W-land. There were only very short periods during the entire day when W's could not be heard. During these periods nothing else could be heard either. Thus, W, VE and Central America Hams reaped the biggest harvest of Easter Island contacts.

Of the 1538 QSO's made: 996 were W's, 108 were LU's, 97 were CE's, 68 were G's, 36 were

(Continued on page 55)

Commentaries

A Department of Constructive Suggestion

Do you have some ideas that you have never been able to follow through to completion? In working on one project did you accidentally uncover another interesting fact that might be up someone else's alley? Would you like to get some more ideas on how to approach a problem and at the same time see if anyone else has taken a crack at it?

If so, the answer is "Commentaries" a place to discuss your experiments, ideas or gimmicks.

"Commentaries" is designed to fit the need for a place to publish material that does not exactly merit feature billing, or which is not specific, or short enough to be of use in the "Shack and Workshop" department.

All items used are paid for and contributions should be directed to "Commentaries," c/o CQ Magazine, 67 West 44th Street, New York 36, N.Y.

Mobile Installation Briefs

Loading Coil Protection

While stationed at the Camp Pendleton, California, Marine Base, the salt-laden atmosphere quickly ruined the metal cans over my mobile antenna loading coils. Therefore, I replaced them with polystyrene covers as illustrated in the first picture. To do so, I obtained a length of polystyrene tubing approximately the same diameter as the old can, and a piece of ¼-inch flat stock.

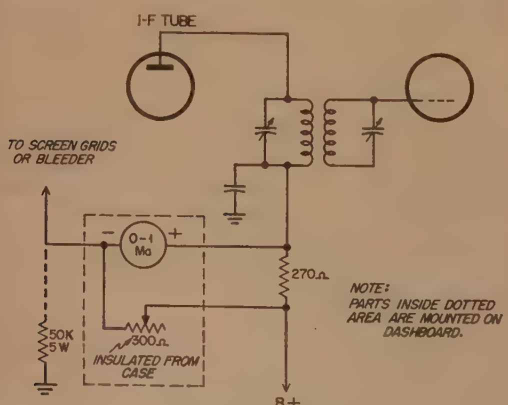
After cutting the tubing to a length to cover the coil, I cut a piece from the flat stock on a bandsaw to fit over the end of the tubing. Next, I drilled a hole in its center to pass the a[n]tenna stud before cementing the two pieces t[o]gether. I used *Duco* household cement, bu[t] regular polystyrene cement should work at lea[st] equally well.

Naturally, it was necessary to readjust th[e] loading coils after changing the covers.

Mobile Receiver S-Meter

I certainly missed not having an S meter o[n] my mobile receiver. The second picture an[d] the diagram *(Fig. 1)* illustrated how I remedi[ed] this. I used an *S*-meter salvaged from an ol[d] *National* receiver, but any meter with a on[e] milliampere movement will serve equally wel[l].

I mounted the meter and the "zero-adjust["]resistor in a discarded metal box, which hap[-]pened to have a hole in one end just the righ[t] diameter to accommodate the meter. I the[n] mounted the assembly under the automobil[e] dash board. A three-wire cable connects th[e] meter into the automobile receiver.



W1KYK S-meter circuit.

Polystyrene loading coil cover designed by W1KYK to replace a corroded metal cover. Incidentally, there is considerable evidence that removing the cover improves radiation efficiency.

The dash mounted S-meter.

A bridge circuit is used to produce a forward movement of the meter pointer with an increase in signal strength. It is connected in the high-voltage lead of any tube in the receiver controlled by the a-v-c circuit. The B+ lead of one of the i-f tubes is a logical place to connect it

The terminal marked "screen grids or bleeder" may be used to supply the screen voltage (through dropping resistors) for the r-f and i-f tubes in the receiver, or it may be grounded through about a 50,000-ohm, 5-watt resistor

Transmitter Rack

The third picture shows the small rack I installed in the trunk of my 1952 *Ford*, to accommodate the mobile transmitter, modulator, and power supply and still leave room in the trunk for other purposes. It is constructed of angle iron salvaged from an old Army bunk. The side pieces are drilled and tapped for *10-32* screws to accept standard relay rack panels. The holes are spaced alternately ½-inch and 1¼-inches apart, center-to-center, vertically, and 18¼ inches apart horizontally

The rack top fits into a groove across the top of the trunk hump, and screwing the shock mounts on the side pieces and the diagonal braces to the floor of the trunk produced a rigid installation unaffected by vibration

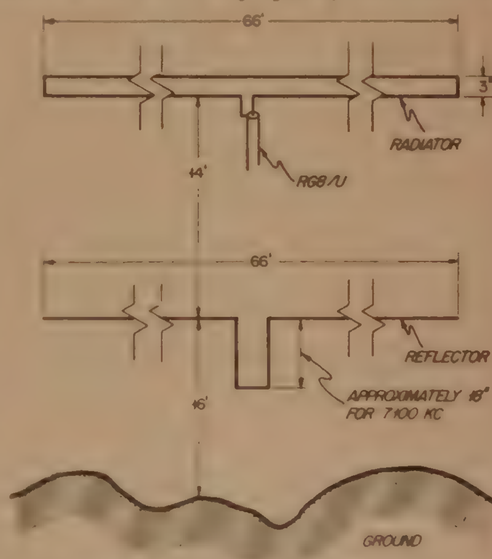
Norman Gertz, W1KYK

This home constructed rack mounted in the trunk compartment easily accommodates the mobile modulator and transmitter.

The Question of a High-Angle Radiator

A few years ago I was struggling away in Virginia trying to compete in the *CD Party* and *Sweepstakes* with W4KFC and some of the other boys in the *Potomac Valley Radio Club.* As far as I could determine, my results on contacts beyond about 500 miles were as good as those of any of the other locals. Inside that 500-mile radius I just didn't seem to be laying down any type of signal.

Examination of the one-hop *F2*-layer transmission nomograms indicated that angles of radiation between 35 and 85 degrees were called for My verticals were radiating most of their stuff well below 30 degrees. Drawing that 500-mile radius on a map quickly convinced me that plenty of contest customers were being passed up (unintentionally) and a good high angle radiator was needed



Mounting a reflector under the antenna.

Getting away from the trend towards verticals, my first antenna was a horizontal end-fed wire, 134 feet long and averaging about 30 feet above ground level. It was somewhat better, but not what I had in mind as being satisfactory. The trouble appeared to lay in the poor ground under the antenna which rose and fell from 20 to 60 feet below the antenna as it wandered through the pines

Waynick and Hacke[1] have shown from a

Continued on page 69)

1. J. E. Hacke and A. H. Waynick, "Restricted Range Sky Wave Transmission," Proc. I.R.E., vol. 36, #6, June 1948, p. 787.

Gathered by DICK SPENCELEY, KV4AA

Box 403, St. Thomas, Virgin Islands, U. S. A.

We welcome the following newcomers to the HONOR ROLL

W2QHH	**39-219**
W6KYG	**37-200**
W6YK	**37-144**

At Time of Writing

COCOS ISLAND, TI9: W6UXX is presently on another trip which should put him in the vicinity of this QTH around November 1st. Evan feels that his chances of getting on the air this time are good. There will be other chances to get Cocos off your chest as TI2TG advises the possibility of two treasure expeditions coming to pass sometime between November and February. TI Hams who may go along include TI2AB, TI2RC and TI2ES. On top of this we quote an item from the West Gulf Bulletin of Aug. 22nd: "The West Gulf DX Club has tentative plans for a DX-pedition to TI9, Cocos Island, at the end of the present rainy season, probably some time during the month of December. Present plans are for at least two members to go down to Costa Rica and be joined with at least two TI2's. Contributions are requested to help assist in the jaunt and will be published in the Bulletin from all members as well as those not in the Club. All calls contributing will be given special consideration for contacts while there which will be from ten days to two weeks. So boys, get on the band wagon and let's go. Contributions should be sent to W5FXN and marked "For the TI9 expedition."

ANDORRA, PX1: W6SAI advises via letter from PX1YR that Yves has now been officially licensed after passing his code examination and has expressed a liking for CW. He will run 80 watts to a folded dipole.

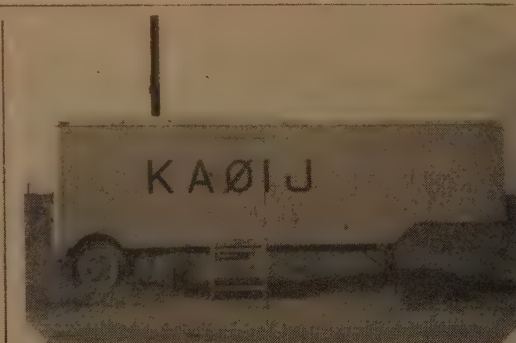
• • •

RUDOLPH ISLAND, UA: OK1MB reports a UA sta tion will be active from a weather station from thi QTH, near Nova Zemlya, and has been seeking per mission to contact W stations. The country status o this spot has not been determined.

• • •

ZANZIBAR, MAURITIUS, NYASALAND, G2RO/VQ1RO/VQ8AY/ZD6RO: Bob Roberts reports on his recent activities at these spots as follows: "In VQ1RO I had a fine time as I was able, for one night, to use an antenna supported by two 200 foot masts. A couple of hundred W stations and many other countries were contacted. W's were worked at the rate of one every 20 seconds! Operation at ZD6RO was a disappointment due to poor QTH and only 27 contacts were made, one being a startling KG6. A few W's were QSO'd using the call of VQ8AY. Among them were W5MET and W1HX. Operations at VQ2RO were fair but no W contacts were made due to very poor conditions in that direction. Due to transportation weight limitations I had to

(Continued on page 32)



As the only Ham station on IWO JIMA, KAØIJ, is kept plenty busy with state-side traffic. The rig is housed in the trailer seen above and consists of a BC-610 transmitter and Super-Pro receiver. Ops. Capt. Tex Crayton and Bill Cierebeij are shown in the left photo with Tex in the operating position. Antenna is a V-Beam.

Right—Well known on the bands is W5MET, Dick Kemp, of Rogers, Ark. Dick alternates between W5MET and W5MET MM. The home rig runs 300 watts to an 813. First licensed in 1932 as W9LZO, Dick has also held the calls of W8QJN and W3IWK.

Center—KV4BB, the source of those potent phone and CW signals from St. Croix, Virgin Islands, is operated by Bill Thomas, ex-W4CG. Bill's first crack at the ARRL phone contest netted him a score of 176,080 which was "tops" for stations outside of W and VE. Yep, Bill runs a kw. and has the usual assortment of rotary beams.

Right, below—No chair can hold Warren Newcombe, W6WYC, when those rare W7's come pounding in!!

Signals from EAØAB, Spanish Guinea, get a big boost from the rotary beam pictured below. The OM, Angel Garcia Margello Barbera Esq., is seen here getting a birds-eye view of the photographer. Photo Courtesy of W4RBQ.

(from page 30)

borrow a receiver at each QTH visited. While these have always been available some have been in very poor condition and I have been considering the construction of a lightweight TRF battery receiver (90v/1.5v) to cover 14 Mc. only." G2RO will visit many rare spots in the next year and a half and he pleads that all contacts be of the "contest type" variety limited to a simple RST report. The occasional W station who insists on holding him for no good reason ruins the chances of many others. Request for "Please listen for my phone" will be ignored. Bob will arrive in New York in Mid-November and will next be heard from the West Indies. You will be kept informed of all his future moves.

• • •

AR, MP4: MP4BAU showed up on 026 2215 GMT QSO'ing W5AVF. We take it that Adi now has his new CW rig going and we look forward to plenty of activity from him. For Qatar phone contacts watch for MP4ABW 110/190 kc.

• • •

CAMBIA, ZD3/TIMBUKTU, TU2: from PAØUN and G3AAM we hear that Jim, ST2UU, is considering a trip to these spots in late September or early October. This appears to be a change of plan which formerly included Yemen in the itinerary. These QTH's are not definite, but, knowing Jim, we expect him to show up somewhere! The TU2 prefix was mentioned but Timbuktu apparently comes under the FF8, French Sahara, call. Some activity from Gambia would be very welcome.

• • •

JAN MAYEN, LB5/6/8: LB8YB has now moved from Myggbukta Island, off Greenland, and is now very active from Jan Mayen. He may be found on 7020 kc. QSO's were noted with W6CGQ, W6RW, VE2WW and W6KYG around 0145 GMT. It will take a year for QSL's to come through.

• • •

NICOBAR ISLANDS, VU5: VU5AB has been active from this spot on phone. Watch 14190 kc. around 1500 GMT. See QTH's.

• • •

RIO DE ORO, EA9: EA4BH confirms his intentions to be on from this country for a two weeks' stay which should have started about October 20. The trip of EA2CN/EA2CA to this spot may also have been heard from by now.

• • •

RUANDA URUNDI, OQØ: Furthering our efforts to have this QTH separate we have just received the following letter, long awaited, from the Belgian Society, U.B.A.:

"I am at present able to confirm officially that the Ruanda-Urundi Territory, Prefix OQØ, may be considered as a separate radio country. It has beeen long and tedious working to convince certain authorities that this measure has no political signification, but now everything seems clear at last. I apologize for the long delay, but you will understand that we had to have the consent of all authorities concerned before giving this confirmation. We hope that this will result in numerous contacts for the lucky few amateurs installed there, and many points for numerous fellow amateurs all over the world. 73

(Sig) Jos Mussc
President, U.B.A

Presently active in Ruanda-Urundi are OQØCZ, 050 CW, and OQØDZ on phone. It is also reported that W6TOT will soon be active in this area as OQØFZ. We have forwarded the above data to ARRL in hopes that a formal announcement accepting Ruanda-Urundi will soon be forthcoming.

• • •

AMIRANTE ISLANDS, VQ9UU: G2MI advises th this group falls, administratively, under the Seychell group and thus VQ9UU's operation there on Augu 11 will probably count the same as a Seychell QSO. This will be looked into further.

• • •

DX NOTES IN GENERAL

KS6AB has been active on 065 around 0200 GMT . . . **I5LV** holds forth on 060, See QTH's . . . **VK9WZ** h been on from the Admirality Islands. He counts t same as New Guinea. Watch 7030 and QSL via W.I. . . . Another SVØ/Crete visit was rumored for Se but no signs up to Sept. 16th . . . The **DI9AA** we ha been hearing with a very chirpy and drifting QRI is t German ship "XARIFA" of the Hans Hass unders photography expedition. All communication depends DI9AA on the 3.5, 7 and 14-Mc. Ham bands. (Via W Gulf Bulletin) . . . Dick McKercher, HZ1MY etc. is n back in the states where he hopes to be heard short from **WØMLY**. See QTH's . . . **CR8AB**, the son CT1CB, is in Portuguese India, but his gear is still Portugal. Has anyone any solid dope on CR8A? . . . W5NMA reports **KC6AA**, Yap Island, active on phon xtl 14228 plus VFO while W5ALA overheard W6TM working **VR6AC**, Pitcairn Is. 002, Aug. 11 . . . WØED nabbed **FU8AA**, 064, 0855 GMT while **FW8AB**, Wal Is., has been heard several times by VR2CG and QSO' by ZL3JA on 105 . . . G3AAM reports contacts wi **KAØIJ**, A3, 14270 at 0930 GMT and with **VR4AE**, 0 at 1200 GMT . . . DL4JN nabbed Saja, **AC3SQ**, 080 1430 GMT . . . **ZC5VS** is active again after a layoff a may be heard on 079 between 1300/1500 GMT . . . CR5AC holds forth on xtl 008 (drifes to 011) most da around 1930 GMT while **HR1AA** may be heard, co centrating on European QSO's, 006, 2230 GMT and late Jack should be settled in new QTH in Tegucigalpa now with new beam antenna. He says QSL via HR1A

F3AT, ex-FF8AP, is plenty active in F-land now. Iv says he may go to FL8 in a couple of years . . . KX6U plans to move to Truk, using **KC6UZ**, for an extend stay . . . Henry **JZØKF**, continues activity from Dut New Guinea, 033, 0335 GMT. ARRL is holding a bun of QSL's for him . . .Plenty of activity emanates fro Argentine Antarctica through the efforts of LU4Z LU3ZO, LU5ZO, LU3ZS and LU4ZD. This is emblished VP8AJ on 008 . . . **TA3AA** (via W9RRG) wishes known that he is again active on all bands during wee ends and holidays . . . A number of **EA9DC** QSL's ha been coming through thanks to the efforts of EA4B . . . The Russian situation remains foggy. **UR2M** showed up on Aug. 26, 095, QSO'ing everything sight. **UG6KAA** was heard calling CQ DX and **UAØKK** was heard calling VS6CG. We have a couple of pa who intend to QSO UA3KAA, Central Radio Club, Mo cow, and try to get the real lowdown. KV4AA QSO' **UA3AF** who gave QTH as Moscow and all seemed the up-and-up . . . **FK8AE** has been QSO'd on 702 0900 GMT. He also appears on 030.

Exploits

G6ZO upped to an imposing 247 with CEØAA, VQ7U and **VQ9UU** while **W2BXA** added the same three

(Continued on page 52)

Amplitude Modulation Review

A Down-to-Earth Discussion of Modulation Efficiency with Plate Modulation in One Corner and the Various Types of Constant or Controlled-Carrier Screen Grid Modulation in the Other

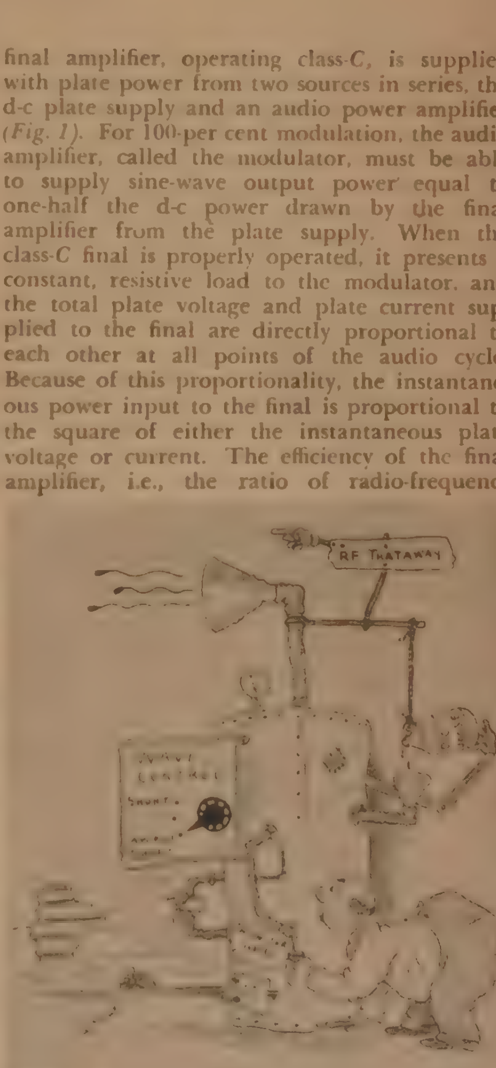
G. FRANKLIN MONTGOMERY, W3FQB

Contributing Editor, CQ

Planning a new phone transmitter, either for mobile installation or for the home station, nearly always involves deciding whether to use plate modulation or one of the several available types of screen-grid modulation.[1-8, 17] Both have advantages, and the choice between them depends upon equipment already on hand and upon the goal of the planner. The technical object in building a transmitter is to construct a device that will convert d-c power obtained from batteries or a power supply to radio-frequency power, and there are occasions when we are interested in the efficiency of this conversion. For example, if the plate supply is limited, as in a mobile setup, which modulation method gives the greatest efficiency? If a particular final amplifier tube is to be used, which method gives the greatest power output? In view of the large number of published articles on modulation schemes, it is understandable that there is some confusion in response to questions like these, and it is the purpose of this article to compare the merits of plate and screen modulation in order to furnish some clear answers. The discussion will be limited to ordinary AM omitting single-sideband technique, and will begin with constant-carrier transmission, reserving controlled-carrier refinements until later.

Constant Carrier

Plate modulation is one of the oldest methods used by amateurs to effect radiotelephony. The final amplifier, operating class-*C*, is supplied with plate power from two sources in series, the d-c plate supply and an audio power amplifier (*Fig. 1*). For 100-per cent modulation, the audio amplifier, called the modulator, must be able to supply sine-wave output power equal to one-half the d-c power drawn by the final amplifier from the plate supply. When the class-*C* final is properly operated, it presents a constant, resistive load to the modulator, and the total plate voltage and plate current supplied to the final are directly proportional to each other at all points of the audio cycle. Because of this proportionality, the instantaneous power input to the final is proportional to the square of either the instantaneous plate voltage or current. The efficiency of the final amplifier, i.e., the ratio of radio-frequency



"The . . . object . . . is to construct a device that will convert d-c power . . . to radio frequency . . ."

1. Byron Goodman, "Clamp-Tube Modulation," QST, March 1950, p. 46
2. George R. Lippert, "A 'Constant-Modulation' Phone System," QST, April 195[illegible], p. [illegible]
3. G. K. Hickin, "Improved Clamp-Tube Modulation," CQ, July 1951, p. 24
4. Richard M. Smith, "Screen-Grid Modulation of the Modern-Style 813 Transmitter," QST, October 1951, p. 38
5. John L. Reinartz, "Screen and Grid Modulation," CQ, December 1951, p. 43
6. Byron Goodman, "The Rothman Modulation System," QST, January 1952, p. 56
7. Max I. Rothman, "Rothman System of Modulation," CQ, April 1952, p. 21
8. C. O. Bishop, "A System of Gating Modulation," CQ, October 1952, p. 19

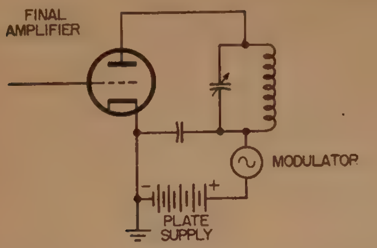


Fig. 1. Basic schematic for plate modulation.

ower output to instantaneous plate power in-ut, is constant, regardless of what the in-tantaneous input power may be. We can re-ard the class-*C* final as simply a convenient levice for converting the power that it consumes o radio-frequency power, and it is immaterial vhether the supplied power is audio or d.c.; oth are converted with the same efficiency.

Contrast this situation with screen modulation *Fig. 2)*. Once again, the final amplifier is op-rated class-*C* but receives plate power, at a ixed voltage, only from the d-c plate supply. The output of the audio amplifier, or modula-or, is applied in series with the supply to the creen grid, and since the final plate current lepends upon the voltage of the screen, the late current will vary with the audio voltage. The power consumed by the screen grid is much ess than that consumed by the plate, so that he audio power output of the modulator need e only a small fraction of the power that would e necessary to plate-modulate the same final. For ideal operation, the plate current is direct-y proportional to the instantaneous screen voltage, and, since the plate supply voltage is ixed, the instantaneous plate power input to the final is also proportional to the screen voltage. For linear modulation,[3, 9] however, the radio-requency power output must be proportional o the square of the plate current, as in the late-modulated case. In consequence of this equirement, the instantaneous efficiency of the inal amplifier also must be proportional to plate current.[10, 11, 17] In screen modulation, therefore, we can again regard the class-*C* final as a device or converting d.c. to radio-frequency power but with the distinction that it does so with an ef-iciency proportional to the power that it con-sumes. (Note further that, except for minor lifferences in the amount of audio power re-quired of the modulator, the same operating principles apply to control-grid or suppressor modulation.)

Considering the general principle that one does not get something for nothing, plate modu-lation and screen modulation are not as dif-ferent as they may appear to be. In plate modu-lation, it is first necessary to generate consider-able audio power at only moderate efficiency and then to convert it to radio-frequency (that is, sideband) power by supplying it to the class-*C* final. In screen modulation, the average efficiency of the class-*C* final is low because of the requirement that instantaneous efficiency be proportional to plate current, but since it is unnecessary to generate large audio power to begin with, nothing much has been lost in the process. We can regard screen modulation as a method of using a relatively large radio-fre-quency amplifier to perform the functions of an ordinary plate-modulated final and modula-tor combined. There are still differences in the two methods, however, and it is our purpose to examine the differences more carefully.

With constant-carrier operation, the effective-ness of the transmitter increases with the strength of the transmitted carrier, and it seems fair to compare systems on the basis of the car-rier power that a given power supply can pro-duce. Accordingly, we choose to calculate the *overall carrier efficiency*, that is, the ratio of carrier output power to the total d-c plate power supplied to the final and the modulator when the carrier is modulated 100-per cent by an audio sine wave. If we let P_o represent the car-rier output power and P_s the d-c plate power, then the overall carrier efficiency is

"In view of the large number of published articles on modulation . . . there is some confusion . . ."

$$E = \frac{P_o}{P_s}$$

Let us see what this efficiency turns out to be for several different choices of modulator.

Plate Modulation

Plate modulation involves two efficiencies, the efficiency of the class-*C* final and the modulator

9. George Grammer, "Some Facts of Modulation," QST, March 1951, p. 49
10. George Grammer, "Some Aspects of Screen Modula-tion," QST, November 1951, p. 41
11. Frank C. Jones, "Some Experiments with Screen Grid Modulation," CQ, January 1952, p. 13

ficiency. Remembering that the modulator must supply an audio output power equal to one half the d-c power supplied to the final, we can calculate the total d-c plate power as

$$P_s = \frac{P_o}{E_{cf}} + \frac{P_o}{2E_{cf}E_{am}}$$

where E_{cf} is the class-C final efficiency and E_{am} is the modulator efficiency. The first term in the sum is the d-c power supplied to the final, and the second term is the d-c power supplied to the modulator. The equation can be rewritten in the form of the overall carrier efficiency

$$E = \frac{P_o}{P_s} = \frac{2E_{cf}E_{am}}{1+2E_{am}}$$

Now let us assume some typical efficiencies for the different classes of amplifiers. The final, of course, will be operated class-C, the modulator may be either class-A or class-B. If we assume a working efficiency of seventy per cent of the maximum theoretical efficiencies for the three classes of amplifiers,[12] and allow a small additional amount of plate power for the modulator driver in the class-B case, then the efficiencies are

$$E_{am}\ (\text{class } A) = .35$$

$$E_{am}\ (\text{class } B) = .50$$

$$E_{cf}\ (\text{class } C) = .70$$

When a class-A modulator is used, the overall carrier efficiency is, then,

$$E\ (\text{class } A) = \frac{2(.70)(.35)}{1+2(.35)} = .29$$

and for the class-B modulator,

$$E\ (\text{class } B) = \frac{2(.70)(.50)}{1+2(.50)} = .35$$

These overall efficiencies mean, simply, that for every 29 watts of carrier output, 100 watts of d-c plate power must be supplied when a class-A modulator is used; if a class-B modulator were used instead, 100 watts of d-c power would be sufficient to provide 35 watts of carrier.

Screen Modulation

Screen modulation involves only one efficiency, that of the final amplifier itself, but we have seen that this efficiency changes with modulation. The peak efficiency of the final under modulation will be the same as the constant efficiency of the same final if it were plate modulated: the efficiency of the final with no modulation is one half of this figure. If we allow an additional five per cent of the supply power for the screen modulator tube itself, then

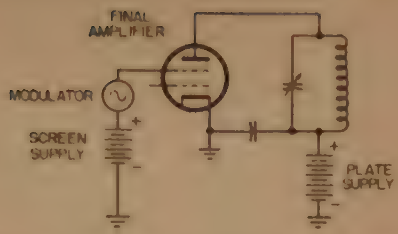


Fig. 2. Basic schematic for screen-grid modulation.

$$P_s = (1.05)2\left(\frac{P_o}{E_{cf}}\right)$$

and

$$E = \frac{P_o}{P_s} = \frac{E_{cf}}{2.7}$$

If we assume, as before, that $E_{cf} = .70$, then

$$E\ (\text{screen}) = 0.33$$

which means that 100 watts of plate supply will produce 33 watts of carrier.

Examination of the three overall carrier efficiencies shows that there is really very little reason to choose between plate and screen modulation from the efficiency standpoint, and the choice must therefore be made on other grounds. How about final plate dissipation? The discussion at the beginning makes it plain that if we are to use screen modulation, and therefore require the final amplifier to act as r-f generator and modulator combined, the tube itself must be somewhat larger than is needed otherwise. How much larger must it be?

Plate Dissipation

The plate dissipation of a plate-modulated final is maximum with full modulation. The average input to the final with full modulation is one and one-half times its d-c power input, and the power dissipated at the plate, P_d, is simply that fraction of the input power that does not appear as useful r-f output, or, in terms of the carrier output power,

$$P_d = (1.5)\frac{(1-E_{cf})P_o}{E_{cf}}$$

If E_{cf} is .70 as before, then

$$P_d\ (\text{plate mod.}) = (1.5)(.30)\frac{P_o}{0.70} = 0.64P_o$$

which means that the plate dissipation is 64 per cent of the carrier power.

One of the odd consequences of the variable-efficiency characteristics of screen modulation is

12. F. E. Terman, Radio Engineers' Handbook, First Edition, McGraw-Hill, New York, 1943, pp. 379, 393, 445

"Plate modulation is one of the oldest methods . . ."

the fact that maximum plate dissipation occurs with no modulation; the plate cools off when modulation begins (we are still assuming constant-carrier operation). The power dissipated at the plate is, again, that portion of the plate input power that is not converted to useful output, or

$$P_d = \frac{(1-E_{rf}/2)P_o}{E_{rf}/2} = \frac{(2-E_{rf})P_o}{E_{rf}}$$

where the factor 2 appears because the carrier efficiency, as before, is only one-half the peak class-*C* efficiency. If $E_{rf} = .70$, then

$$P_d = \text{(screen mod.)} = 1.30 \left(\frac{P_o}{0.70} \right) = 1.86P_o$$

or, the plate dissipation is 186% of the carrier power. As a matter of curiosity, let us calculate the plate dissipation for 100 % sinusoidal modulation. For these conditions, it turns out that the average efficiency is exactly 75% of the peak efficiency E_{rf}, the extra 25% being due to the production of r-f sideband power. The plate dissipation, then, is

$$P_d \text{ (screen, full mod.)} = \frac{(1-3E_{rf}/4)1.5P_o}{3E_{rf}/4}$$

$$= \frac{(4/3-E_{rf})\,(1.5)\,P_o}{E_{rf}}$$

For $E_{rf} = .70$,

$P_d = 1.36\ P_o$

or 136 % of the carrier.

Constant-Carrier Comparisons

We are now in position to construct tw tables giving typical operating data. *Table* assumes that we have available for the fir and modulator a source of d.c. at 450 volts an 100 milliamperes, or 45 watts, and shows t

TABLE 1. SUPPLY POWER P_s = 45 WATTS		
MODULATOR	FINAL PLATE DISSIPATION P_d (WATTS)	CARRIER POWER OUTPUT P_o (WATTS)
CLASS A	8.4	13
CLASS B	10	16
SCREEN	28	15

required final plate dissipation and the carr power output that can be expected using eith plate or screen modulation with constant-carr transmission. *Table 2* assumes instead that have available for the final a tube rated at 13 watts plate dissipation (such as the 2E26) a

TABLE 2. PLATE DISSIPATION P_d=13.5 WATTS		
MODULATOR	TOTAL d-c POWER INPUT P_s (WATTS)	CARRIER POWER OUTPUT P_o (WATTS)
CLASS A	73	21
CLASS B	60	21
SCREEN	22	7.3

shows the expected carrier output and the to d-c power input required, including power su plied to the modulator, when the final operated at its maximum rated dissipation.

Controlled Carrier

A method that has recently regained pop larity, particularly in connection with scre modulation, is controlled-carrier operation.[13] The concept of controlled carrier is a sim one. The modulating speech wave of voi transmission is not a constant-amplitude wav and consequently the modulation of a consta carrier averages considerably less than 100 p cent. In practice, if the speech wave is und torted and if the modulation reaches 100 p cent only on voice peaks, the average modu tion will be only 20 to 25 per cent. With su a low modulation percentage, transmission a full, constant carrier represents wasted pow because the full carrier is really necessary or during those short intervals when the spee wave attains its maximum amplitude. Carri control is a method whereby the amplitu of the carrier is maintained just sufficient accommodate full modulation; when the a plitude of the speech wave is small, the carr level is low, and so on. The circuits used effect this control of the carrier are vario [2, 6, 7, 8, 13, 14, 15, 16], but in principle they all o erate by substituting a special modulating vo

13. George Grammer, "Screen Modulation with Limi Carrier Control," QST, April 1951, p. 64
14. Donald H. Mix, "Carrier Control with Self-Bia Clamp-Tube Modulator," QST, November 1952, p.
15. Frank C. Jones, "Further Experiments with Scr Modulation," CQ, December 1952, p. 17
16. Jose A. Vivares, "Controlled Carrier with a Cath Follower," QST, September 1952, p. 15
17. W. I. Orr, RADIO AMATEURS' MOBILE HAN BOOK, Cowan Publishing Corp., New York, 19 pp. 79-83.

age for the ordinary audio output of the modulator. This special voltage consists of the regular audio output in series with a slowly varying d-c voltage whose amplitude is equal to (or slightly greater than) the peak amplitude of the audio. The d-c voltage cannot be allowed to change as rapidly as the variation in the audio wave itself, or severe modulation distortion will result. Instead the d-c voltage, while it may build up rapidly at the beginning of a burst of speech, must necessarily decay rather slowly. Its action is quite similar to that of the a-v-c voltage in a receiver; it responds to the variations in the peak amplitude of the audio waveform averaged over some small interval of time, in much the same way that the a-v-c voltage responds to variations in the peak amplitude of a received r-f signal.

The saving in average carrier power that is obtained in controlled-carrier operation can be used to generate a transmitted signal having greater peak power during modulation than would be possible with the same final as normally operated. If there is no distortion, intentional or otherwise, in the speech wave that is used for modulation, the ratio of peak power to average power is about 12 to 15 db. The plate dissipation of the class-C final depends, of course, on the average power input, so that controlled-carrier operation, with undistorted speech, will permit operation of the final at higher peak inputs as long as the maximum voltage and current ratings of the tube are not exceeded. If we take the peak-to-peak power ratio as 12 db., then we would expect that carrier control, with plate modulation, should allow us to transmit an effective signal power sixteen times that of a constant-carrier transmitter. But there is a limitation here, because the generator of large peak power requires high supply voltage on the final. A power increase of sixteen times requires that both peak plate voltage and peak plate current be increased by a factor of four relative to the constant carrier conditions and there are few tubes, obviously, that will withstand such an increase within their ratings. Usually we cannot expect to increase the plate supply voltage of the final to much above its maximum rating for plate-modulation service. The conclusion, for plate modulation, is that controlled-carrier operation offers little practical advantage except, of course, that the average d-c power consumption of the final may be reduced considerably for the same peak-modulation carrier output.

The situation is somewhat different for screen modulation. Since the final plate voltage in this arrangement is fixed, we can generally operate the final with a plate voltage about twice its maximum c-w rating. This increase in itself would yield a peak power no greater than that obtainable from the same tube in plate-modulated service, but with constant-carrier operation and screen modulation it is usually impossible to run the final this hard without exceeding its rated plate dissipation (see *Table 2*). If we again assume a difference of 12 db. between peak and average levels of the modulation waveform and assume that the low-level modulation can be represented approximately by a sine wave, then the plate dissipation for controlled-carrier screen modulation is, approximately,

$$P_d = \left[\frac{(1-3E_{rf}/16)}{3E_{rf}/16} \right] \left[\frac{(1.5)P_o}{16} \right] = \left[\frac{(16/3-E_{rf})}{E_{rf}} \right] \left[\frac{(1.5)P_o}{16} \right]$$

where P_o is the carrier output for peak modulation. The average carrier output is one sixteenth of P_o. If E_{rf} is .70, then

$$P_d = 0.62\, P_o$$

This dissipation figure of 62% of the peak-modulation carrier power compares favorably with the 64% value that we have found for constant-carrier plate modulation and shows that carrier control in screen modulation permits use

(Continued on page 67)

"... There is ... little reason to choose between plate and screen modulation from the efficiency standpoint ..."

The Mail Order Antenna

A 40-Meter Vertical for the Space Starved Amateur

R. W. JOHNSON, W6MUR

1202 Avoca Avenue, Pasadena 2, California

Getting a 7-Mc ground-plane antenna on a mall city lot can be quite a problem. After all, 32 to 36 foot antenna does not stand up by tself, unless it is made of some special (and usually expensive) material. The little matter of erecting a guyed "whip," without breaking t in half in the process is also something to consider. Then, there is the base insulator, as vell as the location of the radials, to worry about. The radials are around thirty-five feet long too, you know.

Looking up from the base of W6MUR's vertical. The small diameter tube on the left is the matching section. It is ten feet long, one inch in diameter and four inches from the radiator.

The "Sears-Roebuck Special" eliminates or avoids most of these problems. Its evolution began upon noticing in a *Sears* catalog that aluminum irrigation tubing, with 0.050-inch walls, was listed in twenty-foot lengths and in diameters of two, three, and four inches, at a cost of $4.85, $6.75, and $8.95, respectively.[1] I ordered a length of each of the larger sizes.

The tubing proved to be very rigid, therefore, I joined the two lengths together in the manner shown in *Fig. 2*. First, I cut four pieces of plywood, 48 x ¾ x ½ inches, to use as spacers between the two pieces of tubing. After dressing them down to fit, I wrapped them with thin flashing material (*Sears* "Valley Roll," 0.19 x 14 inches—$2.38 for a ten-foot roll), so that they would become conductors.

Next, I telescoped the two lengths of tubing together for four feet, with the aluminum-sheathed wooden strips evenly spaced between them. The assembly is held together by six ⅜-inch threaded rods (Cut from *Sears* "Redi-Bolt Rod"—sixty-five cents for a three-foot length) completely through tubing and spacers, three in one direction and three more at right angles to them. Nuts and washers on the rods and some strong-arm work with a pair of wrenches finished this part of the job.

The complete 36-foot length weighs twenty-eight pounds, and when held horizontally from one end, the sag is just discernible.

Installation

I dug a hole four feet deep in which to set the antenna with a standard post-hole auger. It

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1. Not all Sears catalogs list this tubing, which is described on page 842 of the spring-summer, 1953 edition (No. 206) of the catalog distributed in the Los Angeles area. If not listed locally, it can be ordered from: Sears, 925 South Homan St., Chicago 7, Ill. It is also available from other sources.

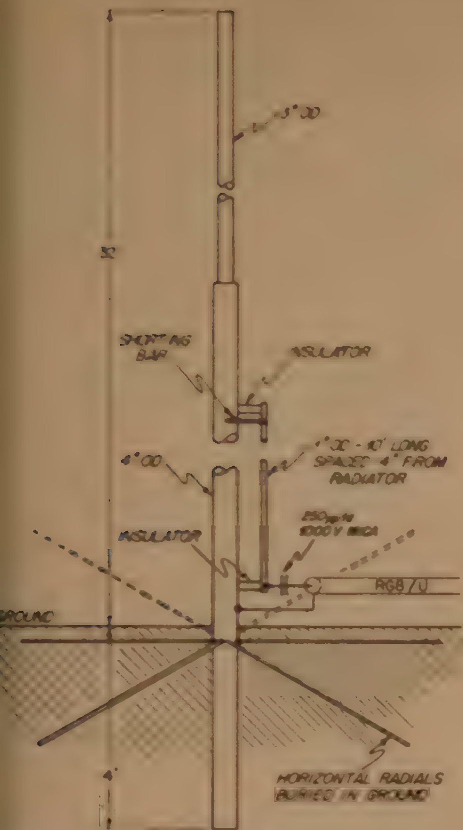


Fig. 1. Working sketch of the 7-Mc. vertical described in this article. The details are thoroughly explained in the text.

ppened that the only suitable place in the d for the antenna was beside a neighbor's rage. After the hole was dug, I leaned the tenna against the garage and worked it down o the hole.

Holding the antenna vertical with one hand, pushed dirt into the hole around it and mped it down firmly with a "two by four." is operation took five minutes! And I am der powered. I now had a self-supporting tical antenna, thirty-two feet high.[2]

Next, I fastened a ten-foot length of one-inch meter aluminum tubing left over from an old am, parallel to the bottom section of the enna and four inches from it, as indicated Fig. 1. Insulators are *National GS-3* or equivnt (These I could not find in the *Sears* alog.) Double-thick bands of the flashing aluinum fasten the insulators to both pieces of ing and are also used for the shorting bar at top of the matching section. The bottom he one-inch tubing extends to about an inch l a half from the ground.

To reduce ground losses, I next installed a set of four, buried, No. 9, aluminum fence-wire radials. (*Sears*—$6.10 for 500 feet.) I used a lawn edger to cut slots in the ground a few inches deep in which to bury them. One radial angles across the lawn and is connected to a water pipe. The others run off in different directions, as permitted by buildings and other obstructions.[3] The incisions in the lawn healed in two days to where they were no longer noticeable. Copious watering helped heal the scars.

The feed line is RG-8/U, 52-ohm, coaxial cable, which may be buried. Its shield connects to the base of the antenna at the same point at which the radials are connected, and the inner conductor is connected to the one-inch diameter tubing through a 250 µµfd, 1,000-volt, mica condenser (good for up to a kilowatt input). The SWR is less than 2:1. It could be made to approach unity by careful adjustment, but the difference in results would be negligible.

The condenser is important in obtaining a low SWR on the feed line. Only at the ends and at points a whole multiple of a ¼-wave from them does a resonant antenna represent a pure resistance. At other points along its length, there is also a reactive component present. With this feed system, the reactive component is reflected to the feed point as inductive reactance, which is tuned out by the capacitive reactance of the condenser.

Adjustment

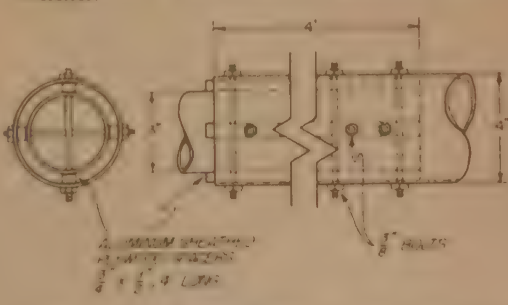
Although duplicating the antenna shown will result in an efficient antenna, the following information is included for the benefit of those who are experimentally inclined or who wish to vary the dimensions in the matching section.

Adjustment procedure is this: substitute a variable condenser of about 300 µµfd. capacity for the fixed condenser. Connect an s-w-r meter

(Continued on page 68)

2. In locations where the temperature drops below freezing, rain and moisture trapped inside the tubing might freeze and split it; therefore the four feet that are below the ground should be plugged and a few small holes drilled in the tubing near the ground level to prevent water from accumulating—Editor.

3. The radials are not absolutely necessary. The antenna will work without them at reduced efficiency, because of higher ground losses. Their exact length is not critical, but should be at least ¼-wave long (thirty-five feet at 7 Mc.), if possible. A minimum of four gives best results. Ground losses will continue to decrease slowly as additional ones are added. Broadcast stations use 120, equally spaced around the base of the antenna —Editor.



MAT—20' LENGTHS ALUMINUM TUBING—1 LENGTH 3" OD x .05 WALL 1 LENGTH 4" OD x .05 WALL.

Fig. 2. Method of joining lengths of three-inch and four-inch aluminum tubing.

The VHF-UHF News

FURMAN C. COBB

c/o CQ Magazine, 67 West 44th St., New York 36, N.Y.

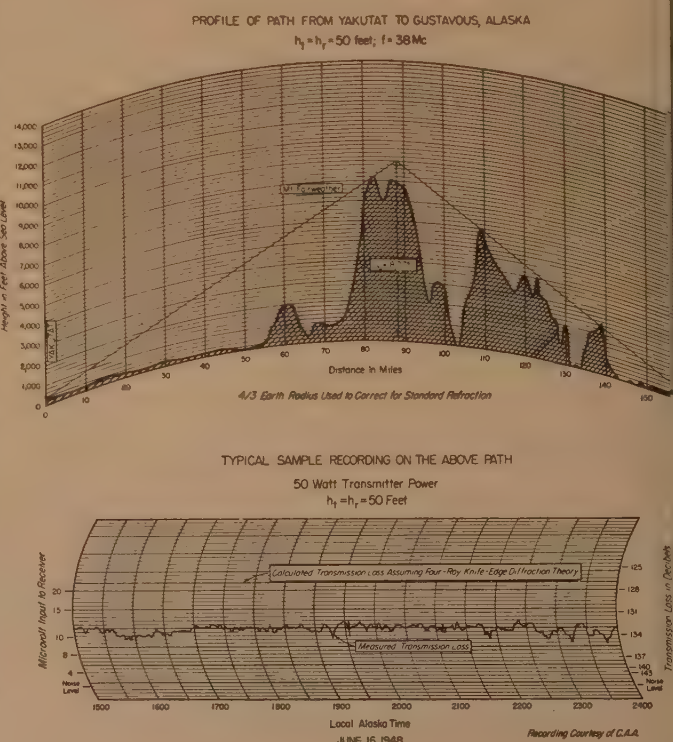
Anyone Have a Nice High Mountain?

In the early part of September the National Bureau of Standards (particularly the CRPL) released "Summary Technical Report 1805" describing *obstacle-gain* v-h-f transmission. The essence of the report is that a nice high sharp obstacle located near the mid-point of a proposed v-h-f path will actually *increase* received signal strength! It seems that the old idea of climbing up on top of a ridge or mountain is totally unnecessary, plenty inconvenient and far too expensive. The same effects are sometimes possible by just backing away from the mountain and letting "knife-edge" effect take over.

Knife-edge effect, or obstacle-gain as the CRPL prefers to call it, is not a new theory (the Bell Telephone Laboratories predicted it as early as 1933). Prior to CRPL experimental verification few v-h-f workers had given it any serious thought as a means to extend point-to-point coverage. V-h-f transmission in mountainous areas was known to be lossy and plagued with severe erratic fading. Physchologically, the idea of a mountain between the transmitter and receiver was never considered too healthy. Now it appears that the bigger the intervening mountain the better the chance of getting over it with a lot stronger signal than if the mountain weren't there in the first place.

The accompanying illustration shows the pro of the path in Alaska (160 miles long) which utili the obstacle-gain knife-edge of Mt. Fairweather reduce the signal loss. With 50-watt transmitters a 50-foot high antennas the loss over this path at Mc. would be of the order of 207 db.* However, the basis of obstacle-gain theory, which combi diffraction and ground reflection effects, the prec table loss should be only 127 db. The experimen results showed the loss to be 134 db., within 7 of the value predicted.

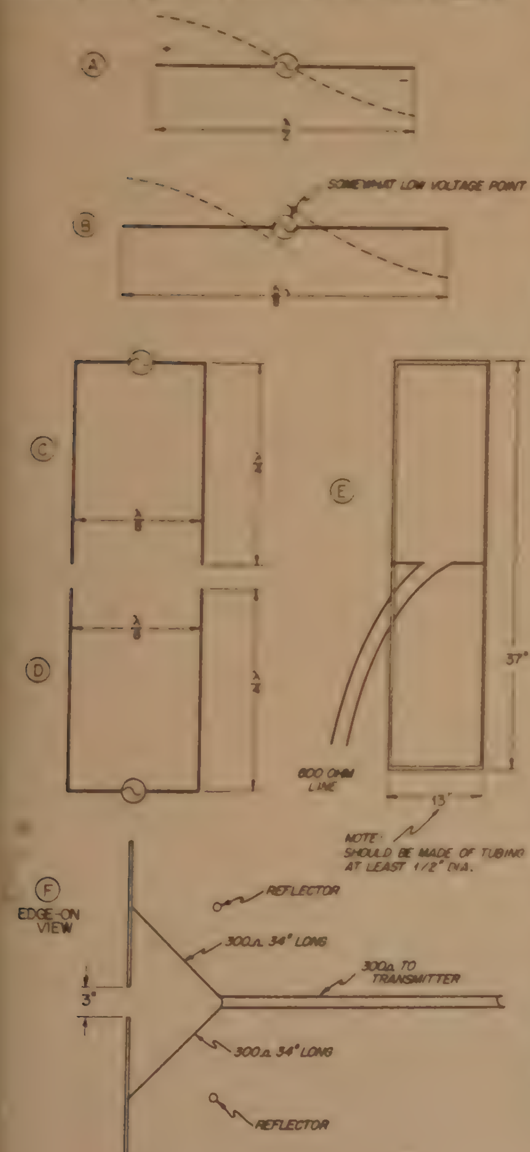
* I will discuss transmission losses in a later colu For those to whom the term is new it might be wel point out that this figure was obtained by assum the earth to be perfectly smooth and spherical. He any loss figure less than the predicted value may construed as a "gain" over the theoretical transmiss loss.



Experimental evidence of the obstacle-gain phenomenon obtained by the Civil Aeronautics Administration. The top figure is a profile of the transmission path from Uakutat to Gustavous, Alaska (160 miles) with the knife-edge of Mt. Fairweather utilized to reduce the signal loss. The power was 50 watts and the antennas were only 50 feet above ground level. With the 8775-foot mountain between the two terminals the signal increased 73 db. above the theoretical level. The bottom graph shows a sample recording.

nounced reduction in signal fading. It was brought out in the Summary Report that the high angles (relatively speaking) required to graze the top of the mountain causes the radio waves to miss the turbulent lower portion of the troposphere which creates most of the fading. During a 30-day test period the signal strength over the mountain varied by less than plus or minus 2 db around the mean value of 134 db.

Just what this means to the fellows working 6 and 2 meters is fairly difficult to predict. One of the basic requirements for the obstacle-gain theory to be of any value is that the height of the knife-edge be much greater than the elevation of the common horizon. In other words, at 2 meters and over a 150-mile path, a mountain rising only 1500 feet above the surrounding terrain would not have the desired effect. Theory predicts that the 30-db loss might be



Derivation of the "skeleton slot" antenna for 144 Mc.

expected above and beyond the normal transmission loss.

It would appear that obstacle-gain will be most important to the gang in the Rocky Mountain area, possibly not for DX, but for consistent work out to ranges of 180-200 miles. If nothing else, this experimental evidence does show that the California gang once again have the drop on the east coast boys—imagine getting signal gain because someone put a mountain in your front yard!

The "Skeleton" Slot Antenna for 144 Mc.

G2HCG attacked an interesting subject in the January 1953 issue of the **R.S.G.B. Bulletin** when he described his experiments with slot antennas. Such antennas are supposed to be particularly useful on only the u-h-f bands. At those frequencies it is mechanically feasible to cut a rectangular hole in a large metallic surface and by feeding it in an appropriate manner make it radiate reasonably well. Its greatest use today is in flush mounting in the skig aircraft.

OM Sykes, G2HCG, seems, however, to have reversed the design and constructed his antenna out of tubing formed into the shape of a rectangle. His final dimensions as shown in the accompanying drawing were 13 inches by 37 inches fed with 600-ohm line. The long side of the "skeleton" slot (it is reported) must be vertical to radiate a horizontally polarized wave. However, your reviewer thinks that considerable energy is also going out in the vertical plane at the same time and would like to call for more experimental evidence before making final acceptance of the design.

The series of drawings on this page demonstrate the design sequence of the "skeleton" type so-called slot antenna. In A we see the usual straight dipole, in B we have the ⅝-wave extended antenna and in C the wave ends are bent downwards. The latter antenna still radiates a portion of its output in the same manner as the straight antenna. Now if we stack another antenna directly below it, but "upside down" we may join the ends since they are at the same potential. Carrying it a little further we can short out the feed points and take another feed point, say at the center of the "skeleton." The top and bottom sections still radiate appreciable horizontally polarized energy, and since they are stacked ½-wave apart they will "beam" broadside to the array.

With a single reflector spaced a quarter-wave behind the "skeleton," this antenna is supposed to have a 4 db. forward gain as compared with the straight dipole. Stacking seems to be possible and the final sketch shows the method of feeding with 300-ohm line and matching sections into a pair of "skeleton" slot antennas.

While this is an interesting design and may possibly be of use in certain instances (lends itself to extreme mechanical rigidity) the theory is certainly not too clear, and, as described by G2HCG, is somewhat confusing—especially when the requirement of at least ½-inch tubing is considered. All-in-all, we'd like to see some experimenting since this antenna might get around the necessity of polarization shift in areas where both horizontal and vertical polarization still has adherents. It is not a magic array and on close examination looks very much like our old friend, the "Bruce" array.

Meteor Propagation Tests by W4HHK

During the past few years a fairly heavy emphasis has been placed upon the contribution of meteoric ionization to the E-layer. Many scientists have shown that when a meteor is swept into the earth's atmosphere the velocity is so great (on the order of 30 to 80 miles per second) that ionization takes place in a cylindrical volume constituting the meteor path or trial. This ionization is momentary and seems to concentrate at a height of from 50 to 75 miles above the earth's surface. This is the area of the so-called E-region.

It has been shown that a certain number of meteors will each day produce a residual background ionization and that some of the bigger and faster meteors will momentarily produce sufficient ionization to refract radio waves up to 150 Mc. The general term used to distinguish these short-periods is "bursts." The active duration of the bursts has not been clearly established and there is some evidence that a short period of two-way communication might be possible using this mechanism.

Starting around the first of July, W4HHK and W5RCI have been engaged in a series of schedules with W2AZL, W2NLY, W2UK and other interested parties to ascertain the potentialities of meteoric ionization burst transmission. Most of this work has taken place on 144.020 Mc.

At this writing the northern end of the path has copied both W4HHK and W5RCI (identified complete calls). The southern end has obtained copy on W2AZL, W4A[illegible]

and W2UK. Bursts have also been heard that according to the schedules and frequencies should be credited to W2NLY, W3GKP and others. Equipment is being improved, and at latest reports W2UK was erecting a 30-wavelength per leg rhombic while W4HHK was gathering the components for a kilowatt rig.

The schedules have been nightly, 2215 to 2235 EST, with the northern end calling on the odd five-minute periods and W5RCI and W4HHK transmitting on the even five-minute intervals. Morning schedules are also being attempted from 0600 until 0630 EST on the same calling and listening basis.

While undoubtedly these tests are not something that will completely change the character of v.h.f. propagation as it applies to Hams, they should be valuable towards furthering our knowledge of meteoric type ionization. If contact can be established for a short period of time it may also provide a means for a WAS on 144 Mc.! We shall report further on these tests in a later issue.

Some Thoughts on New Products

The Amperex Electronic Corporation has just announced their "junior" version of the popular AX9903 or 5894. It is a twin tetrode called the 6252. The plate

Radio Apparatus DR-200

dissipation is only 20 watts (ICAS) as compared to the 40-watt dissipation of the AX9903. The manufacturer reports a power output of 12 watts at 600 megacycles. Physically it is 3 inches in overall height, and slightly less than 1¾ inches in diameter. The 6252 sounds like it would be particularly useful in mobile transmitters and as a buffer/multiplier into the 420-Mc. band.

An increasing number of 2-meter operators have been turning to the commercial channels just outside the upper edge of the band to watch for DX openings. Spotting a frequency in the 152-174 Mc. range, they have monitored a channel used by the police, forestry or fire stations some 80 to 150 miles away. A notable increase in signal strength is a good indication of a possible opening. A good bet for this job is the latest communications receiver put out by **Radio Apparatus Corp.**, 55 N. New Jersey St., Indianapolis, Ind. It is called the

Amperex 6252

Model DR200 and has provisions for both spot frequency operation, or for tuning manually the range of 30-50 Mc. and 152-174 Mc. Naturally, it is strictly NBFM. The cost is supposed to be very low.

Notes

Our V.H.F./U.H.F. column was cut back this month due to some extra space requirements that came in at the last moment. Next month we will be back with a full 3-plus page column . . . Many thanks to G5CD who recently sent in some material on his helical antenna for the 420-Mc. band. Photograph and details next month . . . Various club papers throughout the country are now allocating space each month to V.H.F. columns. Out in New Mexico, W5RFF has been doing a nice job reporting for the Albuquerque VHF Club in the CQ/NM Bulletin. His latest column reported that W5NSJ was set up on 220 Mc. and looking for contacts. Also K5NRX was sending code practice on 2 meters on Monday, Thursday and Saturday at 1930 local time.

STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233) SHOWING THE OWNERSHIP, MANAGEMENT, AND CIRCULATION OF CQ, published monthly at New York, N. Y. for October 1, 1953.

1. The names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Sanford R. Cowan, 6 Embassy Court, Great Neck, N. Y.; Managing Editor, Oliver P. Ferrell, 67 West 44th St., New York 36, N. Y.; Business Manager, Sanford R. Cowan, 6 Embassy Court, Great Neck, N. Y.

2. The owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual member, must be given.) COWAN PUBLISHING CORP., 67 West 44th Street, New York 36, N. Y.; Sanford R. Cowan, 6 Embassy Court, Great Neck, N. Y.

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(Signed) S. R. COWAN, Publisher

Sworn to and subscribed before me, this 28th day of September, 1953.

HARRY N. REIZES, Notary Public

Monitored by LOUISA B. SANDO, W5RZJ

24th St., Los Alamos, New Mexico

Often this column turns out to be more of a family affair than just of and for the YLs. After all, amateur radio is becoming increasingly a hobby for the whole family, so it is only natural. Many a YL's story is so closely tied with that of other members of the family that her's can't be told without including theirs. Such is the case of the Battin family of Elgin, Ill., whose story we are very happy to share with you.

It's an all-Ham family—Edith, W9OTO; her OM Everett, W9OWD; daughter June, W9OTM, and son John, W9MEM. It all started with John. He had such an all-consuming interest in things radio that he started repairing receivers at the age of 9½ years! He was 13 when he got his Ham ticket. He is now 16, and in addition to his Hamming he has a good radio service business which he carries on in a 2-room trailer in the back yard. One room is the service room and the other the Ham shack. Of course, he has built his own rigs and is now running 500 watts, phone and CW, operating mostly 40 and 80, and 20 CW, where he likes to go after DX.

All this Hamming had a very strong influence on the rest of the family, and about two years ago Edith, Ev and June all took their exams on the same day—and came up with calls so similar. June is 19 years old. She graduated from the Elgin high school in '52 and now works for a shoe store. For her station W9OTM runs about 40 watts using a Lysco 600 transmitter with additional modulator, and she has a BC348 receiver. She operates mostly CW on 40 and 80 (holds a 20 WPM CPC), but she does get on 75 and 40 phone once in a while. June also does some of her own repairing. Other hobbies include reading, dress making, crocheting, bicycle riding with her brother, and she plays violin in the Elgin Civic Orchestra each winter.

Edith, W9OTO (also known as "Honey"), and her OM, W9OWD, share the same station. They have been on CW mostly until John recently built them a new rig which they also use on 75 and 40 phone. They also get on 160 some in the winter. Their receiver is an S-40.

Practically a club by themselves, they are all charter members of a new radio club begun in Elgin last January. June is secretary-treasurer. Ev helped out with code classes and the club has "graduated" five Novices and two General Class licensees since its beginning. All the Battins are "Rag-Chewers" and John has WAS. Edith, at this writing, needed only Nevada to complete her WAS.

Not only do the Battins share their radio hobby, but also their interest in helping less fortunate people. Ev, W9OWD, is a minister and musician. He is totally blind and has been for 28 years. He plays several instruments, including piano, piano accordian and guitar, and it is through his music that he makes his livelihood. Most of his preaching is done in the missions on Chicago's "Skid Row." The whole family helps when he has a service. They take complete charge, supplying special music, pianist and song leader. They sing group numbers, duets or solos. Ev and Edith both play piano and when she sings solos she accompanies herself with her Spanish

(Continued on page 63)

YLs enjoying the New Hampshire State Convention at Concord on Sept. 13th: Left to right, front row: W1FTJ, VZD, UBM, BCU, OAK, UZR, WTQ, WOY. Second row: W1YYM, RYJ, QJX, W8ATB, W1SVN, TRE. Third row: W1YFV, VFK, ZEJ, W4AVA, W1VYH. Fourth row: W2KYF, W1WIT, YYU, VOS, OME, UFM. Fifth row: W1UET, ULF. Last row: W1RLQ, UKR, QON, FOF, YPQ.

ALL TIMES IN E S T

EASTERN, USA TO:	15 Meters	20 Meters	40 Meters	80 Meters
Western Europe	0830-1200 (3)	0630-1330 (3-4) 1300-1500 (2)	1600-2100 (3-4) 2100-0430 (2)	1800-0230 (3)
Central Europe & Balkans	0800-1330 (3)	0600-1500 (3-4) 1500-1630 (2-3)	1700-2200 (3-4) 2200-0400 (2)	1830-0200 (3)
Southern Europe & North Africa	0730-1400 (3-4)	0600-1500 (3-4) 1500-1600 (3)	1700-2000 (3-4) 2000-0200 (3)	1830-0230 (3)
Near & Middle East	0730-1130 (2)	0700-1300 (2-3)	1730-2300 (2)	1830-2230 (1)
Central & South Africa	1000-1400 (1)* 0730-1400 (2) 1400-1600 (3)	0600-0900 (1) 1300-1730 (2-3)	1730-0100 (3)	1900-2300 (2)
South America	1000-1500 (2-3)* 0800-1500 (3-4) 1500-1700 (4-5)	0700-1530 (3) 1530-1730 (4) 1730-1900 (2) 0000-0200 (2)	1830-0600 (3-4)	1930-0400 (2-3)
South East Asia	Nil	1500-1800 (0-1)	0300-0700 (0-1)	Nil
Australasia	1000-1200 (1) 1600-1830 (1)	0730-1130 (2) 1130-1900 (0-1)	0200-0800 (2-3)	0300-0700 (2)
Guam & Pacific	1630-1800 (0-1)	1600-1900 (1)	0100-0600 (2-3)	0200-0500 (2)
Japan & Far East	Nil	1500-1700 (0-1)	0200-0700 (1)	Nil
West Coast, USA	1200-1700 (2-3)	1000-1130 (3) 1130-1700 (2) 1700-1900 (3-4)	2100-0700 (3)	2200-0600 (3-4)

ALL TIMES IN C S T

CENTRAL, USA TO:	15 Meters	20 Meters	40 Meters	80 Meters
Western & Central Europe	0800-1100 (1-2)	0700-1230 (3) 1230-1430 (1-2)	1700-2000 (3) 2000-0400 (1-2)	1830-0130 (2-3)
Southern Europe & North Africa	0700-1300 (3-4)	0600-1330 (3-4) 1330-1500 (2)	1700-0100 (3)	1830-0130 (2-3)
Central & South Africa	1000-1300 (1)* 0700-1330 (2) 1330-1500 (3)	0530-0830 (1) 1230-1700 (2-3)	1700-0000 (3)	1830-2200 (2)
Central America & Northern South America	1100-1400 (2)* 0730-1400 (4) 1400-1600 (4-5)	0600-0900 (3-4) 0900-1500 (2-3) 1500-1800 (4) 0100-0230 (1-2)	1800-0500 (4)	1900-0400 (3-4)
South America	0900-1500 (2-3)* 0700-1430 (3) 1430-1600 (4)	0600-0800 (3) 0800-1500 (2) 1500-1800 (4) 2300-0200 (2)	1800-0530 (3-4)	1900-0500 (2-3)
Japan & Far East	1500-1730 (2)	1800-2000 (1)	0200-0700 (1-2)	0230-0600 (1)

ALL TIMES IN C S T.

CENTRAL, USA TO:	15 Meters	20 Meters	40 Meters	80 Meters
South East Asia	Nil	1500-1800 (1)	0200-0600 (0-1)	Nil
Hawaii	1300-1600 (1-2)	1000-1130 (2-3) 1130-1800 (1) 1800-2000 (2)	2200-0800 (3-4)	2300-0600 (3)
Australasia	1700-1900 (0-1)* 0900-1100 (1) 1500-1900 (2)	0800-1130 (2) 1130-2000 (0-1)	0200-0800 (3)	0300-0700 (2)

ALL TIMES IN P S T

WESTERN, USA TO:	15 Meters	20 Meters	40 Meters	80 Meters
Europe & North Africa	0730-0930 (0-1)	0700-1000 (2)	1600-0000 (1-2)	1800-2300 (1)
Central & South Africa	1100-1400 (1)* 0800-1300 (1-2) 1300-1500 (2)	0600-0900 (1-2) 0900-1500 (0-1) 1500-1700 (1-2)	1700-0000 (2-3)	1830-2300 (1-2)
South America	0900-1400 (3)* 0700-1300 (3-4) 1300-1530 (4-5)	0600-0800 (3-4) 0800-1400 (2-3) 1400-1700 (4-5) 2300-0200 (1-2)	1700-0330 (3-4)	1800-0230 (2-3)
Guam & Mariana Islands	1330-1600 (1-2)* 1300-1630 (2-3) 1630-1800 (3)	1200-1700 (1) 1700-2000 (2-3)	0000-0800 (3)	0100-0700 (2)
Marshall Islands	1300-1600 (2)* 1200-1600 (2-3) 1600-1830 (3-4)	1100-1600 (1-2) 1600-1730 (2-3) 1730-2000 (3-4)	2200-0600 (3-4)	2300-0530 (2-3)
Australasia	1400-1800 (2)* 1100-1900 (2-3)	0900-1200 (2-3) 1200-1700 (1) 1700-2000 (2-3)	2300-0700 (3)	0000-0600 (2-3)
Japan & Far East	1400-1800 (1)* 1300-1800 (3-4)	1200-1600 (2-3) 1600-2000 (3-4)	2200-0700 (3-4)	2300-0600 (2-3)
Philippine Islands & East Indies	1500-1700 (0-1)* 1400-1800 (2-3)	0900-1100 (1) 1300-1430 (1-2) 1430-1730 (0-1) 1730-2000 (1-2)	0200-0700 (2)	0300-0500 (1)
Malaya & South East Asia	1500-1800 (2)	1500-1930 (1-2)	0300-0700 (1-2)	0400-0600 (0-1)
Hong Kong, Macao & Formosa	1500-1730 (2-3)	1400-1700 (1-2) 1700-2000 (2-3)	0100-0630 (2-3)	0200-0600 (1-2)

Symbols For Expected Percentage Of Days Of Month Path Open:

(0) None (1) 10% (2) 25% (3) 50% (4) 70% (5) 85% or more

* Indicates time of possible ten-meter opening.

Ionospheric Propagation Conditions

Forecasts by

GEORGE JACOBS, W2PAJ

144 40 72nd Ave.

[illegible]

General Propagation Conditions

10 METERS—DX poor to fair with some daytime openings expected on certain North-South paths.

15 METERS—Fair to good world-wide DX during daytime hours.

20 METERS—Band closing earlier because of decreased hours of daylight. Daytime DX conditions fair to good with Northern Hemisphere signals somewhat stronger as a result of the seasonal decrease in solar absorption and atmospheric noise levels.

40 METERS—Fair to good dark hour world-wide DX possible. Band opening earlier for DX because of early hours of darkness, also closing earlier in the evening on East-West paths because of MUF failure.

80 METERS—Night-time DX fair and improving with considerably less atmospherics. When MUF failure causes 40 meters to drop out, check 80 for openings.

160 METERS—DX possibilities improving with decreased absorption and lower atmospheric noise levels in Northern Hemisphere. DX possible during approximately the same hours as 80-meter openings but on fewer occasions and with weaker signals.

In general, in the Northern Hemisphere during November, solar absorption and atmospheric noise levels continue to decrease, daytime usable frequencies increase and night-time frequencies decrease considerably from summer values.

This overall picture of band conditions is intended to indicate qualitative changes in each band from month to month. For specific times of band openings for any particular circuit, refer, as usual, to the *Propagation Charts.* Commencing last month these *Charts* appeared in a slightly different, but perhaps handier format.

A note to you fellows who conduct local nighttime nets on the 80-meter band. Towards the end of November, and until the late spring, you will experience considerable difficulty keeping satisfactory contact with stations located within a radius of approximately 100 miles. The reason for this is that on a good many nights the MUF for these short paths will drop below 3.8 Mc. after approximately 8:00 p.m. Local Standard Time, and below 3.5 Mc about an hour later. I suggest that you give serious consideration to the 160-meter band or the VHF bands for local network operations.

This month's *Propagation Charts* are based upon a predicted smoothed sunspot number of 16. The *Charts* have been calculated from world-wide ionospheric contours appearing in the CRPL-D series, "Basic Radio Propagation Predictions," issued monthly by the Bureau of Standards. This publication is available on a purchase basis from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., for 10 cents a single copy or $1.00 for an annual subscription of 12 copies.

Methods for using these charts for calculation of propagation conditions on a specific circuit are given in Circular 465 of the National Bureau of Standards, entitled "Instructions for the Use of Basic Radio Propagation Predictions," available for 30 cents from the Government Printing Office.

Information concerning the theory of radio-wave propagation, measurement, techniques, structure of the ionosphere, ionospheric variations, prediction methods, absorption, field intensity, radio noise, lowest required radiated power and lowest useful high frequency is given in Circular 462 of the National Bureau of Standards, "Ionospheric Radio Propagation." This circular is available from the Government Printing Office for $1.00.

One Way Skip

W2JOA, among others, has recently asked for an explanation of "one way skip"—the phenomenon that is occasionally observed when stations from a particular area can be heard, but not worked, especially when the power being used is about the same level at both ends of the circuit.

Considering equal radiated powers at both ends of the circuit (where radiated power is equal to the power into the antenna multiplied by the power gain of the antenna as compared to a reference half-wave dipole, a half wavelength above ground), the laws of reciprocity are generally considered to hold true for radio propagation. That is to say, a radio signal going for example from New York to Rio should be affected by the ionosphere in exactly the same degree as the signal traveling the reciprocal path from Rio to New York. Actually, as far as signal strength goes, this is usually true. In our example, the signal received in New York from Rio should equal the strength of the signal received in Rio from New York. However, the intelligibility of a signal, that is whether it will be heard or not, depends not upon the signal strength alone, but upon the signal to noise ratio at the receiver. The atmospheric noise levels throughout the world vary considerably with geographical

Severe Ionospheric disturbances are expected Nov. 11-12 and 15-17, with the complete period of 11-25 subnormal. Good short wave propagation conditions are expected Nov. 1-10 and 27-30.

area, being highest in the equatorial regions and lowest in the polar regions. It is the difference in atmospheric noise levels that may exist at each end of a circuit that usually accounts for what may at times appear to be a violation of the laws of reciprocity. Going back to our example of the New York—Rio circuit; during November at 1600 EST, the atmospheric noise level on 20-meters in Central America and the Northern Countries of South America, including Rio, is approximately 18 db. higher than those throughout most of the USA. If the signal delivered from Rio in New York is just above the noise level, the same signal strength received in Rio from New York will be 18 db. below the noise level. The Rio signal would therefore be heard in New York but the New York signal would not be heard in Rio, regardless of the fact that both signals are of equal intensity. So while the laws of reciprocity are valid for signal intensities, they do not necessarily hold for signal to noise ratios. The differences in noise intensities that

(Continued on page 60)

Conducted by HERB BRIER, W9EGQ

385 Johnson St., Gary 3, Indiana

Diagrammed in *Fig. 1* is a transmitter designed by Everett Taylor, W8NAF, 1125 Highridge Ave., Dayton 10, Ohio, as a first transmitter for the Novice. Although easy to build, it has that "professional" appearance often missing in simple, home-constructed equipment. Designed to be used with a power supply furnishing 250 to 350 volts, it is capable of handling an input of ten to seventeen watts. The complete unit is pictured in *Fig. 2.*

All data required to duplicate the transmitter can be gleaned from the diagram and pictures. The thought of cutting the socket holes might frighten a constructor who does not possess a socket punch. Fortunately, the aluminum is so soft that it is not too difficult. One method is to drill a number of small holes around the perimeter of a circle the desired diameter, knocking out the center slug and filing the edges of the hole smooth. Another is to cut them out with an ordinary coping saw, pausi frequently to allow the blade to cool.

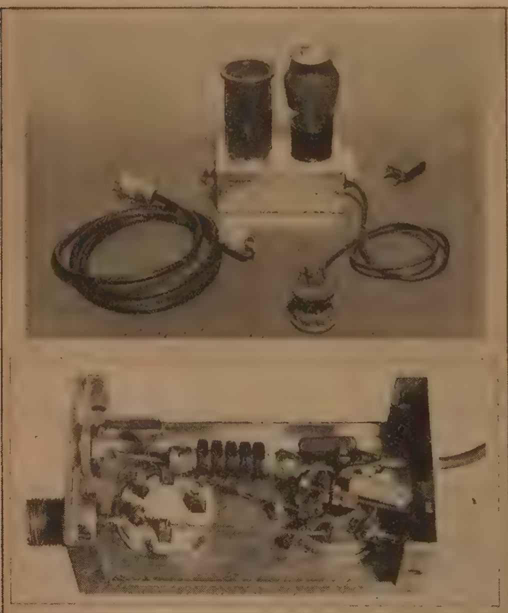


Fig. 2. Attractive Novice transmitter designed by W8NAF and reviewed in this month's column. It is capable of transmitting over long distances under favorable conditions.

An unusual feature of the transmitter is that t tuning condenser is mounted inside the coil for One adjustment of the condenser holds for the enti Novice band. By providing separate coils for t two bands, switching from 3.7 Mc. to 7.2 Mc. c sists of changing the coil and crystal. W8NAF c not give winding data for a 7-Mc. coil, but the o suggested in the parts list should be satisfacto

Obtaining Power
To Operate The Transmitter

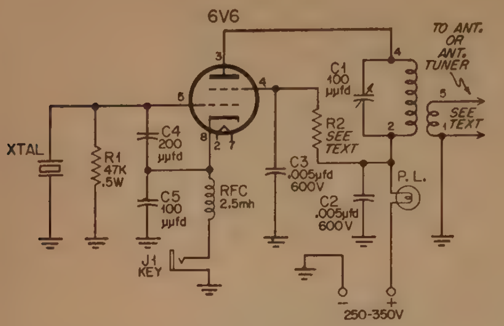
The unusual looking plug on the end of the pov cable is actually an adaptor plug, used by W8N to borrow the power to operate the transmitter fr his communications receiver. To do so, he instal a s.p.d.t. switch in the B+ circuit of the recei power supply to switch the high voltage to *pin No* of the output tube socket in the "standby" positi This pin is unused in octal-based audio pentodes a tetrodes. The adaptor plug brings the voltage to transmitter.

To construct the adaptor, wire together an oc plug (may be an old tube base with all pins) a an octal socket, pin for pin, except *pin No. 6.* transmitter power cable is then wired to it. Fi ments to *Pins 2* and *7*; B— to *Pin 1*; B+ to *Pi* on the plug only. The adaptor is plugged into output tube socket and the tube is plugged into adaptor. Be sure that *pin 1* of the output t socket is grounded to the receiver chassis, and *pin 6* is used as a tie point, all connections to it have to be removed to an extra tie point befor can be used for the transmitter B+ terminal.

In receivers with an auxiliary equipment soc it may be used, instead of the output tube soc to bring power to the transmitter.

As is usually true of any scheme to get someth for nothing, utilizing the receiver power supply operate a transmitter has a number of disadvanta Possibly the most serious of them in the eyes of average owner of an expensive commercial rece is the necessity of making wiring changes in receiver. Unfortunately, the changes are more tensive than merely changing the "standby" swi Not all B+ voltages are tapped off the power sup at the same point. Consequently, it is usually ne sary to rearrange some of the B+ wiring to in

(Continued on page 50)



L1—3.7 Mc., 22½ t. #22 en. close wound.
L2—3.7 Mc., 4 t. #22 en. close wound 3/16" below L1.
L1—7.2 Mc., 12 t. #22 en. spaced wire diameter.
L2—7.2 Mc., 3 t. #22 en. close wound ¼" below L1.
(Coils wound on 1¼" diameter, 5-prong forms, with rib for C1. **Bud No. CF595** or equiv.)

C1—100 µµfd. APC type variable (mounted inside coil form)
C2, C3—0.005 µfd. disc ceramic, 600v.
R1—47,000 ohms ½w.
R2—18,000 ohms 2w. for plate voltage of 350. 10K, 1w for 300 volts. Omit and connect pin 4 of tube socket directly to pin 2 of coil socket for voltages less than 260 volts.
RFC—2.5 mh. radio frequency choke.
P.L.—No. 49, pilot-light plate-current indicator.
J1—single-circuit phone jack.
Tube—6V6 metal or glass.
Xtal—3.7-3.75 Mc., or 7.175-7.2 Mc.
—Also required—
1 octal tube socket
1 5-prong coil socket
1 crystal socket
1 output connector
1 4 x 2⅛ x 1⅝-inch aluminum box (**Bud** or **ICA**)

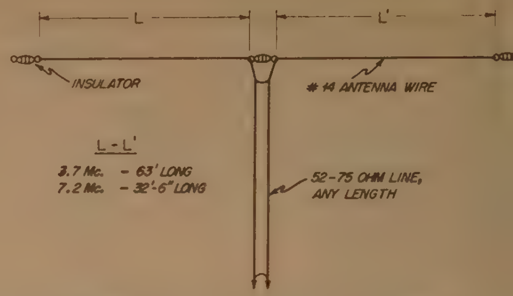
Fig. 1. Schematic, coil table and parts list of the W8NAF seventeen-watt Novice transmitter. Note that tuning condenser C1 is mounted inside the coil form.

that the new switch breaks all B+ circuits.

When this is done, there is a possibility that the key-up voltage will be high enough to endanger the power supply filter condensers. And who knows, the manufacturer might have had a good reason for the way he wired the power supply.

Another point to consider is that using the receiver power supply to operate the transmitter precludes using the receiver as a monitor. Therefore a frequency-meter/monitor would have to be built t comply with FCC regulations.

Considering everything, I doubt if many Novice would care to make the necessary modifications in new receiver to save the cost of a small power suppl especially when the savings would be less than te dollars (at amateur prices) for parts. Some of th older receivers, however, will operate head phone with the output tube removed from the receive entirely. With such a receiver, the power normall consumed by the output tube may be used to operat a small transmitter. In fact, the output tube ma be used as the transmitter oscillator tube. Tran mitter input is limited to that normally drawn b the output tube, which usually totals about fort milliamperes. At the normal receiver plate voltag of approximately 250 volts, this allows an input c ten watts or so.



This half-wave doublet is the most suitable antenna for use with the W8NAF transmitter. For details, see text.

Antennas

Probably the best antenna for use with this tran mitter is a ½-wave doublet, fed with 75-ohm "twi lead," RG-58/U or RG-59/U coaxial cable. Such a antenna is merely connected to the output connecto and the number of turns on *L2* varied to draw th desired plate current.

Other antennas will probably require an antenn tuner. A satisfactory one would be a coil and co denser duplicating *C1*, *L1*, and *L2*. The two *L* windings are connected through a low-impedanc

(Continued on page 60)

KN6NAP, San Francisco, Calif., and operator, Len Geraldi, who is seventeen years old. In three months operation, seven states and three countries have been worked. Receiver is an NC183D. Transmitter is home constructed—a 6V6 driving a 6146 to fifty watts input. Antenna: Coaxial-fed doublet.

Ex-Novice Bill Steinmetz, W4TFP, Sarasota, Fla. Bill uses a five-element beam on 28 Mc., and a long wire on the other bands. Although an avid Ham, Bill, a junior in high school, believes that school comes first. He carries a straight "A" average! P.S. Bill's dad is W4YI.

DX NEWS

(from page 32)

reach 216. CEØAA gave Ben an even 200 on pho . . . PY2CK went to 244 with MP4ABW, CEØAA, ZC5 and VQ7UU. Don Jayme now tops the "phone on section with a comfortable 222! . . . **W3KT** hoisted hi self to 242 with such as ZS9G, VS9AD, VQ9UU, CEØ and VS5ELA. Jesse came up to date with seven phone to reach 164 . . . **W8NBK** tacked on VS9UU No. 241 while **W3EVW** also hits 241 with CEØA VQ7UU and VQ9UU. Rogers A3 CEØAA QSO g him No. 163 in this category . . . **W2AGW** and **W6S** both landed on 240 with Howy adding VS9UU and Fra nabbing CEØAA and JZØKF . . . Luis gave **W6CYI** No. 214 while G8IG climbed to 211 with KAØIJ, CEØA VQ7UU and VQ9UU. Berts phone score went to with KAØIJ . . . **W6PZ** added SP1KAA for 170 wh **W6ID** reported 143 with VS2AL and CEØAA . . . **W6H** came up to date with six additions to reach 136 . **W8KIA** now tops the 39 zoners with 237 the latest be CEØAA and VQ7UU for Glenn.

W2WZ goes to 229 with CEØAA, CR5SP and VQ7 . . . Egon, **4X4RE**, climbs to 225 with assists from L AC3NP, VQ7UU, CR5SP and VQ9UU while No **W1HX**, makes it 217 with CEØAA . . . Mike, **W9F** adds ZC5VS, CEØAA, FK8AE and I5GO to reach . . . **W4GG** also goes to 211 with FG7XA, FB8 CEØAA and MP4BAU . . . **W3DKT** is just behind w 210 after adding CEØAA while EV, **KP4KD**, rises 203 with Luis and VQ7UU . . . Luis also hel **W9HUZ** to 197 while VE3AAZ came up to date w ten additions giving Bill 192 . . . Roy, **W6LW**, ce brated forty years of wedded bliss by hocking PK6 for No. 192 . . . **W9ABA** added such as LZ1KPZ, CR6 HC8GI, CEØAA and ZC4IP to hit 174 while **W6I** went to 144 with CP1BX, CEØAA, LU4ZI and VS2 . . . **W3WU** added five to reach 162 and **W4EPA** mo to 146 with VQ1RO and FQ8AR . . . **OE1FF** made 144 with CR6AI and SVØWP/Crete . . . **W2ZVS** reach 158 with VP8AJ while Jim, **W5FXN**, went to 155 w ZK2AA and CEØAA . . . Ned, **W1RAN**, upped to with SVØWG and Luis as Luis gave **W6ZZ**, No. 130

Lou, **W1MCW**, jumped to quite a lead in the 36 ze A3 section when VR3C, CEØAA and KC6AA gave 206! . . . Winners in the Swiss, USKA, contest of April outside of Europe were as follows: W1BFT, W2V W1RY, OD5LC, W1HA, W2DKF, W1RAN and EA9 . . . **W8YIN** added some nice ones in LZ1KPZ, CEØA 3A2AY, FK8AO and VQ1RO to reach 164. Mickey pla to QRO his 150 watter when he reaches 200 . . . **W2Q** went to 103 on 7 Mc. with ZK1AB, LU4ZO and CEØA Howy also remains at 103 on 3.5 Mc. . . . **KP4** recd his DUF's I, II and III and seeks an Asian F IV. Ev also holds the "WPR-N" Certificate issued contacts with ten WP4's, CW-to-CW, this takes ple of patience! . . . **DL4AY**, ex-W6HJP, slowly approach the 100 mark with his 75A-2/32V-3 combo . . . **W6** worked CEØAA on 4 bands CW and 3 bands pho Don says Luis spent much time CQ'ing during the day so he figures that all the "serious minded" DX' had surely worked him . . . Congrats to Stew Pe on his 160 meter W.A.C. which we believe is the fi of its kind with EK1AO, ZC4XP, EI9J, KV4AA, HC1 and ZL1AH. This was completed when **W1BB** QS ZL1WW, ZL1AH and ZL3RB at 1025 GMT August . . . **OE1FF** received his BERTA Diploma . . . N certificates at **W3EVW** include WAP No. 59, WA No. 450, WAJD No. 57, AAA No. 67 and WAA No.

W6BYB pulled in KS6AB and JZØKF to reach while Lou, **W9ESQ**, pulled in such as VK5JE, ZS6A LU5ZO and F7SHP on 7 Mc. and ZB1CU, CR6 EAØAB, YI2AM and TF3AB on 14 Mc . . . **KV4** keyed with YO3RF, CR7IZ, VQ7UU, VQ9UU, I5U VS9UU and JZØKF and 12 JA stns. Bill's mike counted for such as ST2NW, ZB2I, KAØIJ, KR6A ZD2S, MP4K, ET2LV and ET2ZZ . . . **W9FID** made 217 confirmed with the arrival of CEØAA's card wh **W4ZAE** nabbed HZ1AB on 060 . . . **W6QL** added FK8A 030, and FP8AP, 012 . . . G6YQ celebrated Aug. 23 working AC4NC, 118, at 1730 GMT and AC3SQ, 093, 1700 GMT . . . The 160-meter band keeps in the ne with the report of QSO's between VP4LZ and W2GG W4KFC/W9NH on September 4 . . . **VE2WW** hoo ZL2BG and ZL1CI on 3.5 Mc.

Fifteen Meters

After a two month summer's lull this band is rea coming back with a bang and we look forward to " greatest activity ever" during these fall and win months . . . SVØWE was No. 61 for **KP4KD**. Oth worked were EA9AP, ZP9AY, FA8CR, OD5BH a YN1AA . . . G6ZO made it 84 with ZD4BN (all C

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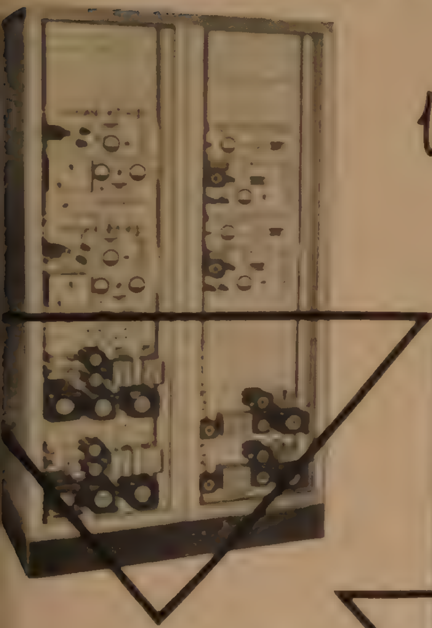

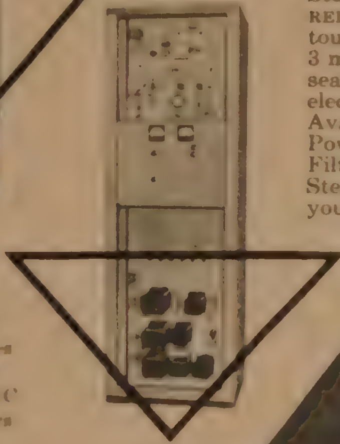

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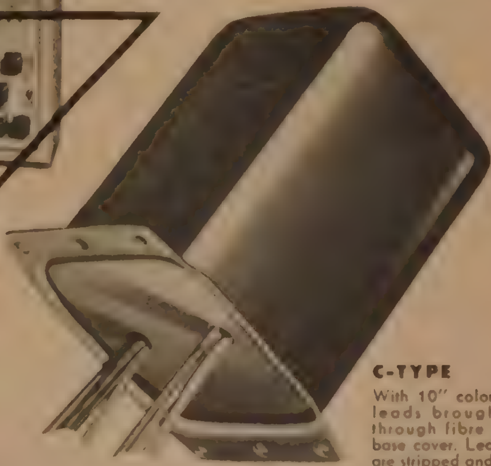

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(from page 52)

. . . KV4BB has connected several times on A8 with ZD9AA, 21220, 1400/1600 GMT . . . **W6ZZ** nailed No. 46 with CEØAA on CW. Miles also A3'd with such as CE1BE, HC1MB, ZP5DC, VK9GW and TI3LA . . . **DL7BA** went to 82 with CN2AP . . . **TI2TG** nabbed OK1HI for No. 76 and reports that the OK stations can work this band during contests . . . **DL3RM** now assumes the 21 Mc. lead with a remarkable 92! . . . YO5LC continues activity on this band . . . **W2WZ** goes to 61 with HC1MB, ZD9AA, PJ2AA and IS1FIC . . . **KV4AA** added HC1JW, OD5BH, CEØAA and ZP9AY for 63 . . . G3GUM's No. 80 was SV1SP!

Here and There

ON4DB is now OQ5GU . . . Some DM2's, Russian zone Germans, have been licensed. Notable among them is Heinz, **DM2ABL**, who runs 200 watts. See QTH's . . . George, **W6BIL**, changed QTH to the country and hopes to have a full grown antenna farm for the contest . . . **W4GG's** kw. is now happily free from TVI. GG nabbed VQ4NZK who is W6NZK . . . **W3KT** nabbed VS9UU as insurance while waiting for VS9AD's QSL . . . OE1FF seeks QSL's from FM7WF, CR7AD, HP1LO, HZ1AB, ZD1PW and MD4BPC. Any help? Frank may be reached via HB9IZ . . . VK3KF regrets to advise that **EL2P** was lost in an aircrash on way home to Ottawa from Liberia. This voids chances of QSL's . . . From **W3RGQ** we hear that a group of W stations will be on for any 160-meter DX each Thursday and Sunday from 0500 to 0700 GMT. Oct. 1st and 4th will be the first week periods. Any info on 160-meter DX may be forwarded to W3RGQ where it will be re-issued in a bi-monthly bulletin . . . **GM3EYP**, ex-VP8AP, should soon be on with a TVI-proof 150 watt rig and a four-element rotary.

VE3AAZ seeks the whereabouts of W6CR/KC6, Palau, QSO'd in July '49 . . . YN1WC, ex-W6EWC, suggests the gang watch 3999.25 kc. for what is probably the only SSB station in Central America. Wayne runs 400 watts to a pair of 813's in a linear that really gets out even through summer QRN . . . **W1RAN** advises that DM2ABL will act as QSL Mgr. for the DM2's. See QTH's . . . **PAØFD** is now 2nd op at PJ2AK. Dick will soon have his own PJ2 call. Six new PJ2's have passed their exams and will soon be allotted calls. Included were a OM/XYL team, the H.C. Waits (Thanks to PJ2AJ for info) . . . Fred, ex-**W5AGB/FM, KF3AA,** says several of his QSL's seem to have gone astray covering North Pole QSO's prior to Jan. 6, 1953. He will be glad to replace upon request. See QTH's . . . CT1CL advises that any CR8 station that has been worked has not been legal. It is hoped that **CR8AB** will be active in the near future.

DL7BA received his DUF IV . . . **DL7AP** was advised by JA5AB that prewar J5CC was killed in Burma during the war . . . **C3BF** will soon return stateside and will answer QSL's sent to W1WAY . . . **W2BUV** sent in QSL's for DXCC . . . Bill, **W9GKK**, now holds **K6CEF**. He works for Collins in Calif. . . . Burt, ex-KG4AF, christened his new call, **W4BQY**, with a KV4AA QSO. Burt should be on with the kw. by now and working on his third DXCC! . . . **W4NWW** is back on again after slight alterations to his gall-bladder . . . W3VES is now **W1ZDP**. Phil is Rod Newkirks b-in-law . . . From W6AM we hear that FW8AB skeds **FK8AO** each Sunday at 2300 GMT . . . **W3GRF** now sports a wide-spaced 14 and 21 Mc. beam in same boom . . . HB4FF was worked on 008. He says he is **HB9PO** operating from a Swiss Military station in Bulach, Switzerland . . . **KG6AUA** will be active on 21 Mc. . . . Several recent EA9DC QSL's have not been credited by ARRL. They are investigating to find out if **EA4BH** has EA9DC's log. This news came from **W8HGW** . . . WØELA advises he will very probably go back to the Orient next spring or summer. He will attempt to put some rare southeastern Asian country on the air. He also may return to Brunei for the benefit of those who missed out last time. Plans are indefinite at this time but we will keep you informed . . . **YN1AA** sent out over 800 QSL's in August. Thereby bringing himself up to date . . . We are glad to see **W6DBT** going strong again after a bit of ticker trouble . . . **KJ6AC** was QSO'ed at Port Arthur, Tex. as **W4DGW/5** . . . W8FWO is now **K2CBQ** in Liverpool, N.Y. . . . **OQ5VN** moved to Stanleyville. See QTH's.

Leo, ex-W6CYY, is now **WØQAZ in Denver** . . . **W8TJM** got a FCC ticket for calling "9UU" . . . See how lucky the rest of us are! The reason was, of course, incomplete identification . . . G2MI, via U.R.E., reports that **EA9DC** has been thrown out of the Society for conduct **prejudicial** to the good name of Spanish Ham radio

. . . . W9TYB, Paul, now ops from 5A4TG . . . . Bill W3RY, is going strong and may be better remembered as ex-KH6VP and K6CT. He will be there for ten months

Latest QSL Addresses

DM2 Bureau	Via DM2ABL Hess, Leipzigerstrasse 11 Dresden, R.Z. Germany
French QSL Bureau	R.E.F. Service QSL Boite Postal 26, Versailles, S&O, France.
HC6FG—	Alfredo Cevallos, Box 93, Ambato, Ecuador. S.A.
I5LV—	Lucien, Box 505, Mogadiscio, Italian Somaliland, Africa.
KZ5CP—	Clark Peterson, Box 383, Cocoli, Canal Zone.
KS6AB—	Ray, Pago Pago, American Samoa, Pacific.
ST2NW—	Norman Webber, c/o IAL, Juba, Anglo-Egyptian Sudan, Africa.
VQ4EH—	Peter, Box 71, Kisumu, Kenya, Africa.
VR3C—	W and VE QSO's via KH6OR
VR4AF—	Via KH6OR
VU5AB—	R.A.F. Detachment, Car-Nicobar. Via P.O. R.A.F. Change, Singapore.
W5AGB/FM, KF3AA—	QSO's before Jan. 6th '53. Fred Whiteside, Box 143, Oakdale, La.
W0MLY, ex-HZ1MY etc.—	Dick McKercher, Box 185, Perry, Iowa.

Thanks to W1RAN, W8KIA, KV4BD, W5FFW, VE3KF, KP4KD and the West Gulf Bulletin.

Deadline for January column, Nov. 15. 73's

Dick

EASTER ISLAND

(from page 27)

ZL's, 26 were PY's, 22 were VE's, 7 were VK's and the rest other countries. First contact on 21 Mc. was with W1VNE. First on 7 Mc. was ZL2ACV and the first on 3.5 Mc. was ZL1HY. The first W on 3.5 Mc. was W6BXL. Ten meters was not used, as that band was closed at all times.

Some of my friends were far from satisfied with single band contacts and many, such as W6AM, W8PQQ, W2QHH, W6SAI, TI2TG and W9HUZ were able to raise me on most of the bands used. It would not have surprised me to have received requests to QSY to 2 and 160 meters and I am still wondering why some of these boys did not request QSO's on teletype and SSB!

Contacts sped along at a rate of from 40 to 50 per hour although on August 11th, 61 contacts were logged in an hour. QSO's on 3.5 Mc. and on phone considerably lowered my all-over QSO per hour average, which stood at 21 after 73 hours of operation over the eight-day period.

During a QSO with W6KJR he innocently told me that I was his first CE contact. He probably did not know that he had nabbed Easter Island and not Chile!

Conditions to Europe were fair with G stations predominating. They came through for a two-hour period during most days. I had counted on making contacts with F, I and OZ but none were heard. Africa was represented by ZS6DW and FA9VN while the only contacts in Asia were with 4X4RE and ZC4IP. In all, 53

(Continued on next page)

(from preceding page)

countries were worked with the first station i
each being as follows: CE3AB, CP5EK, CT1C
CX1CA, DL6IC, EA2CA, EI2T, FA9V
FO8AI, G4CP, GI5UR, GM3DHD, GW3Z
HB9X, HC2LF, HC8GI, HP1TS, HR1A
I1BLF/T, IS1AHK, KH6MG, KL7PI, KP4A
KV4AA, KZ5CP, LU7TA, OA4C, OE1C
OK1MB, ON4AU, PAØUN, PY3DZ, TI2T
VE7VC, VK7KD, VP1AA, VP5AR, VP9B
VR2AS, W6GDJ, XE1IQ, YN1AA, YS1
YU1AG, YV1AA, ZC4IP, ZK1AB, ZK2A
ZL2FA, ZP5CF, ZP6DW, 4X4RE and 9S4A

At noon, August 15, we received our d
parture notice and after a QSO with my ow
station, CE3AG, the big switch was pulled. 11
contacts had been made on CW and 375 o
phone.

It may be said here that although the ba
weather caused us much inconvenience it w
responsible for my staying on Easter Island f
eight days instead of the four or five days
originally planned. Rough seas made unloadi
of the "ANGAMOS" a slow and difficult tas

Difficulty with the electric plant probably co
me about a hundred contacts but after I to
time out to thoroughly clean the carburetor a
went well. An unfortunate moment came fo

Location of CEØAA on Easter Island showing
antenna supports.

lowing a QSO with W8RLT when a nervous r
flex on my part sent the D-104 mike crashi
to the floor, shattering the crystal. Anoth
crystal mike was obtained from the PA syste
on the Island to carry on the phone work. T
Collins 32V-2 and *75A-1* worked beautifully
all times in spite of the rough voyage and ha
dling.

Late in the afternoon of August 15, I b
adieu to the kind people of Easter Island a
after a hazardous trip to the "ANGAMOS"
was able to haul my battered body and
equipment, including the all-important log,
the swaying rope ladder without mishap.

At this point my ambitions to put CEØAA
MM on the air were zero-minus. After a two-d
rest, however, wild horses could not have he
me back and CEØAA/MM was set up in t

dispensary with the enthusiastic assistance of all on board. At 9:20 a.m. on August 18, CP5EK was contacted at the first of some 200 QSO's from CE0AA MM.

During the next seven days the operation of CE0AA MM enabled all the passengers and most of the ship's officers to hold phone QSO's with their wives, children and mothers on the mainland and I assure you I was the most popular man aboard. Many stations were also contacted who had worked me from the island and their kind remarks regarding the expedition were most appreciated.

At last we arrived at Valparaiso on August 25 after a thirty-two day absence, and I set foot on shore with a happy heart and with the overwhelming satisfaction of knowing I had successfully carried out my ambition to put Easter Island on the Ham map. This has been a privilege I am proud to have had and marks the high spot of my amateur career. It also coincided with my 30th year in Ham radio.

To Commander Lira, to the Captain, crew and passengers of the "ANGAMOS" and to the Easter Islanders, go my heartfelt thanks for the kindness and cooperation which made my trip a success. I know this feeling is shared by fellow Hams throughout the world.

My thanks also go to those Hams who sent contributions. These will be used to establish a permanent station on Easter Island with the probable call letters of CE0AC. Most of you should have received your CE0AA QSL's by this date. We had 2,000 printed and are able to take care of everyone who contacted us including requests from SWL's. So—If that card is missing, let us know.

A 522 ON 220 Mc.

(from page 57)

for the purpose of connecting to the 832A plate pins. It will be found that the use of these small diameter wires will necessitate cutting down on the effective size of the tank coils, thereby lowering efficiency appreciably.

Summary

This completes the modification and no trouble should be experienced in tuning up the rig. The tuning dials should fall about half scale and as previously mentioned, the meter readings should be about the same. Power output on 220 Mc. as observed on a 25-watt lamp bulb was just about the same as on a 144-Mc. unit and if the modulation equipment is being used, the rig should modulate approximately the same as on the lower band.

All articles should end up by listing the

(Continued on next page)

(from page 57)

superb DX worked with the equipment described. Well, why should a VHF man not have this privilege? The first QSO using this BC-625 gismo resulted in breaking the then world's record with W5ONS on 220 Mc.

SERVO MECHANISMS

(from page 16)

swung more than 180 degrees, the antenna will rotate in the opposite direction; therefore a habit of swinging the *controller* more than a half turn could soon result in the feeders being torn off, in spite of the stop.

To prevent the antenna from rotating in the opposite direction, first turn the *controller* slightly less than a half a turn. Allow the antenna to rotate far enough, so that an additional rotation of less than 180 degrees will put the antenna in the desired position; then bring the *controller* to the final position.

A normally closed "limit" switch in each motor lead will give positive protection against tangling the feeders. There are a pair of them in the AYLC 1591 motor that must be removed. They may be remounted externally for this purpose.

Although my antenna can only be rotated about a revolution and a half without damage to the feeders, I never relished the though of having to swing a beam 340 degrees to achieve a net change in position of twenty degrees. Therefore, I use no method to limit rotation. So far, I have never wrapped up the feeders. One reason may be that it is easy to inspect them, if I suspect that they are twisting.

DX ANTENNA

(from page 23)

Mc., because it is somewhat shorter than a quarter-wave, its efficiency is reduced, but it does put out a very good signal both locally and at distances of several hundred miles. At night on 3.9 Mc., we have worked stations over 1,000 miles away with this antenna, in the Western U. S., and the West Indies, from W4RXO.

Now for a word about TVI. This antenna definitely helps that situation. In the first place, it is fed by coaxial line, which is buried underground from the transmitter out to the tuning unit. Use of coaxial line enables us to insert a low-pass filter in the line as it leaves the transmitter. If any harmonics to do get by the filter they are discriminated against by the antenna

(Continued on page 60)

(from page 58)

itself, because as we go above 0.58 wavelengths in length, the radiation from a vertical antenna shifts from low to high-angle, where it can't do any harm to your neighbor's TV picture. The 21-Mc., drooping ground plane also discriminates against harmonics because of the mismatch which occurs at harmonic frequencies between antenna and feed-line.

And there you have it—a four-band antenna which takes very little space, which is neat in appearance, and which is easily erected. Comments and questions from readers will be welcomed.

PROPAGATION

(from page 45)

ionosphere to tilt so that they deviate considerably from being parallel to the earth, thus causing a transmission to be scattered in many directions rather than being normally reflected along its great circle path. Additionally, because of the tilt of the horizontal reflecting surfaces, the signal arriving from one direction will strike the reflection surface at a different angle than will a signal arriving from the reciprocal direction. This produces different reflecting characteristics and scattered signals of this nature do not usually obey the laws of reciprocity, and may result in "one way skip." "One way skip" due to scattering can usually be detected by the weakness and characteristic fluttery or warbly fade associated with scattered signals. Scattered signals also usually arrive from directions that seem to bear no visible relationship to the direction of the transmitting station.

Scattering can take place from the regular layers of the ionosphere, Sporadic E layer, from Auroras and also from ground reflection points.

"One way skip" is therefore usually attributed to the geographical variation in atmospheric noise levels or scattering from irregular surfaces.

Thanks to all of you who have taken the time to send me comments regarding "DX and the Sun" which appeared in the July and August issues of CQ. It is gratifying to know that the article was found to be helpful in explaining some aspects of the mechanism that makes it possible for us to transmit radio signals over great distances.

THE NOVICE SHACK

(from page 50)

line similar to the one in the picture, although it may be much shorter than that one.

To tune a sixty-five foot antenna on 3.7 Mc., connect the stator of the condenser to one end of the coil, its rotor to ground, and the antenna to the other end of the coil.

If you wish to tune this antenna to 7.2 Mc., or a 130-foot antenna to either band, connect the condenser across the coil, grounding the rotor end, and conect the antenna to the stator end.

Tuning with either arrangement consists in adjusting the antenna condenser for maximum plate current, then returning *C1* for the "dip" in plate current, varying the number of turns in *L2* to vary loading. Use the minimum number of turns that will permit drawing the desired current.

(Continued on next page)

Letters And General News:

FCC Nabs KP4 Novice While Pirating Other Calls

The Spring and early summer issues of "Ground Wave," the monthly bulletin of the Puerto Rico Amateur Radio Club contain several references to some "lid" appropriating various KP4 call letters. But the pot really boiled over in July when the FCC moved in and apprehended the culprit. KP4ZZ KP4ES KP4MU KP4OB /KP4JM KP4CP KP4OS, etc., was Novice Licensee WP4TQ!

Charges facing WP4TQ include Novice licensee using a VFO, operating on a frequency not assigned to Novices, Use of fictitious call letters, and failure to maintain a log of operation. The four alleged violations occured on ten known days. Section 502 of the Communications Act of 1934 provides a fine of up to $500.00 a day per violation upon conviction, plus suspension of license. Enough said!

If any comment on the above is required, WP4TQ made it. He was assuring the station he was working thusly: "They'll never catch me. I'm too smart for them." At that moment "they" knocked on the door of his shack.

More pleasant news from Puerto Rico is the announcement by the P.R.A.R.C. that they are now issuing a special WPR-N (Worked Puerto Rico Novices) certificate to any station submitting proof of two-way radio contact with ten Puerto Rico Novices, using CW emissions only. Once the certificate has been won, stickers will be awarded for proof of contact with additional P.R. Novices in blocks of ten.

Mail confirmations with return postage to Puerto Rico Amateur Radio Club, Inc., P.O. Box 3533, San Juan, P. R.

They say confession is good for the soul, so here goes. A few weeks ago, I received a postal card from a Novice listing the call letters of the DX stations he had worked on 21 Mc. Sad to say, the card immediately disappeared. If the writer of the card sees this, I offer my congratulations on his fine work of contacting DX on 21 Mc. in the middle of summer when conditions were supposedly the poorest and my apologies for mislaying his card. For what it is worth, the only call letters on the list that I recall are those of TA2EFA (Turkey).

KN2EPZ writes, "Talk about premonitions! The night before I got my ticket, I dreamed that I got the call KN2EPZ. The next day my ticket arrived, and my call is KN2EPZ! I have eleven people who will verify the truth of this story. 73"—Walt, KN2EPZ.

Dan, K2BVQ, writes, "Dear Herb, I received my General ticket last month, so KN2BVQ is gone forever. Tho my call is changed, I'm not. I am still active on Novice 40. My twenty watts and my S-20R (plus audio filter) seem to work best there. As a Novice, I racked up fourteen states and got my code speed up to fifteen w.p.m. But best of all, I made over seventy new friends.

"This letter is written in an attempt to make more new friends. Enclosed is a TVI form letter (Too long to print: Herb). It was gotten out by the Wave Riders, a radio club I am proud to belong to. I would like to extend an invitation on behalf of the rest of the Wave Riders for any teen age Ham or would-be Ham to come to one of our meetings and meet the fellows.

"Clubs are a good way to learn what you must for your new ticket or to learn from the experience of others how to make your procedure top notch. Also, it is easier for a group of people to put up your new antenna than for your to go it alone.

"To date, our club dues are $0.00 per year. When money is needed for form letters, etc., we hold a voluntary collection among our members. Any who wish to join need only to pick up their telephone and call (in Brooklyn, N. Y.) ULster 3-7143, and ask for Dan—that's me. Vy 73"—Dan Grunberg, K2BVQ, 1518 50th St., Brooklyn 19, N.Y.

Eddy, W5ZBC, gets right to the point. "Dear Herb, I got the "N" out of my call. Anyone who has traffic for Arkansas and nearby states can call W5ZBC on 7209 Kc. (In the phone band! Herb) between 3:45 and 5:30 p.m., maybe later. 73"—Eddy, W5ZBC.

From Ontario, Neal, **VE3BRF** writes, "Dear Herb, although I am not a Novice, I am a comparative newcomer to Ham radio. And I like your column in CQ. Been on the air since last September. The very first station I worked was a Novice station—WN2ILQ. Since, I have worked many Novices, being the first VE for many of them.

"I am trying for WAS (worked all states) on "80"

(Continued on next page)

(from preceding page)

and would like to work some of the Novices in the southern states. If any are interested, I would like to arrange a sked. To encourage them, my best Novice DX on "80" was with Betty, WN6QPI (my first YL!), and she was using only twenty-five watts input and a long wire antenna. Fine business indeed.

"My WAS score is thirty-three worked, twenty-five confirmed. Some of my unconfirmed states are in the south. Not Novices, though. I find that they usually QSL 100%. I do too, and that's why I like to work Novices, even at five wpm 73"—Neal, VE3BRF, Box 427, Oshawa, Ontario, Canada.

Don, KN2EGM, has a very common "gripe." "Dear Herb, Well, after a long wait, I have my ticket. I have been on the air for exactly one week and have made about fifteen contacts. Already, I have a gripe. Some of the fellows I ask to QSL reply, 'I will QSL only if you QSL first.' In my opinion, that is being childish and foolish.

"I would like to get in touch with any other Novices in my home town so that we could organize a club. I presume they all read the Novice Shack, therefore, I hope they will give me a call on the air or the telephone. 73"—Don Parker, KN2EGM, 37 Roquette Ave., Elmont, L.I., New York. Telephone: FL 23749.

Richard, KN2DEM, writes, "Dear Herb, I've worked eight or nine states in about two months. I have a Meissner transmitter, running thirty-five watts, an HQ-129X receiver, and folded dipole antennas for 3.7 Mc. and 7.2 Mc. When I operate 3.7 Mc., I use the 7.2 Mc. antenna on the receiver, and vice versa.

"I was thirteen years old today, and I am helping a friend (12) get his Novice ticket. My dad is W2ASI. He has been a Ham for twenty-eight years. 73"—Richard, KN2EDM.

From Roy, WN3WAF, "Dear Herb, I got on the air with the good help of Andy, W3NL. In about two months, I've had about 100 contacts, with fifty-two confirmed. My transmitter uses a 6L6 running twenty watts, and the receiver is an S-40A.

"I live in an apartment and have had some antenna trouble. I would like to hear from anyone with any suggestions. 73"—Roy Goldsmith, 549 Newcomb St., SE. Washington 20, D.C. Phone JO 2-6804.

Help!

Lads requesting help in obtaining an amateur license this month are:

- Bill E. Stroud (16), 168 Hamilton St., Plymouth, Mich. (Wants pen pals interested in amateur radio).
- Burt Cohen, 183 West Scott, Fond du Lac, Wisc.
- Paul Helmick, Jr. (14), 3328 Dartmouth Circle, Montgomery, Ala.
- Edward Jars (14), 21a Richmond St., Philadelphia, Pa. Phone RE 9-1613.
- Donald Kellicutt (16), Horton, Mich.
- Bobby Powell, Drawer #5, Wilson, N. C.
- Leigh Littleton, 730 Fairview Ave., Bowling Green, Ohio.
- Don R. Ruse, 10091 Brecksville Rd., Brecksville, Ohio. (Also interested in forming SWL correspondence club.)
- David Boyd (14), 874 Mill Road, Buffalo 24, N.Y. Tel HO 2013.
- Bob Uuholland, 1656 Liggett Ct., St. Louis 19, Mo.
- Albert Del Rosario, P.O. Box 152, Kahuka, Oahu, Hawaii.
- James G. Wray, 252 Lee St., Hampton, Va. (Has photographic darkroom. Will be glad to develop and print helping Ham's pictures.)
- Johnny Ulmer, 7925 Spruce St., New Orleans, La.

Getting back to our letters, Jack, WØKSF, says, "Dear Herb, As a Novice, I worked forty-two states with fifteen watts input. Now I am running ten watts to a Meissner "Signal Shifter," mostly on 7 Mc. With it, I have worked Bermuda and Mexico, and several Canadians. 73"—Jack, WØKSF.

Myron Smith, SWL/WN2, comments, "Dear Herb, I notice that some SWL's object to sending postage with their cards. I write letters and enclose postage when I report hearing a station. My friend just sends cards. My percentage of replies is over fifty per cent. His is very low. 73"—Myron, 222 Ames St., Rochester 11, N.Y.

Ex-Novice Jim, W3UXO, writes, "Dear Herb, I do not have a rig of my own now, because I am building a new one that will run seventy-five watts to a 6146. But I operate W3PQT, the club station at the Patuxent Naval Air Station. So far, I have worked thirty-four states and seven foreign countries.

"Regarding the letters you receive from fellows who think they will not like CW when they get their licenses: At first glance, it may seem harder than phone, but the thrill that comes from being able to send and receive high-speed code and the fact that one can get out well with relatively simple equipment means much more to me than operating phone. I operate CW almost exclusively and doubt if I will be on phone for a long time if ever. I have a 25-wpm. sticker and can copy almost thirty.

"I am fifteen years old, and I would like to hear from some YLs about fifteen or sixteen. 73"—J. S. Goldring, W3UXO, c/o Dental Clinic, NAS, Patuxent River, Md.

Bill, W4TFP, reports what was probably the first Novice operation from a boat. A condensed version of his letter follows: "On October 13, 1951, two friends and I went on an overnight fishing trip in a twenty-one foot cabin cruiser. The cruiser was designed for two; therefore, with three people, plus complete fishing and diving equipment, there was not room for a rig, but that did not stop me.

"There was no 115v. a.c. on aboard; so I operated the RME 45 and my Novice transmitter from a vibrator power supply and a storage battery. Getting a late start, I just threw the equipment into the cabin until an hour before the schedule I had arranged with W4LMT to notify our parents of our safety. I screwed a twelve-foot collapsible whip on the deck and connected it to the transmitter through a length of bell wire and tuned up. Promptly at 1700, I called W4LMT, who came back with a surprising RST599X report. After handling my traffic and arranging another schedule for the next day, I closed down to conserve the storage battery. It was hard to do, because I heard another Florida station and one in Georgia calling, but I had no choice. The schedule the next day went off with a hitch also, and our parents were waiting when we docked. 73"—Bill, W4TFP. (See picture on these pages for an idea of Bill's present station—Herb.)

Ralph, WN8NMG, writes, "Dear Herb, In eight weeks, I have worked twelve states and Canada. The transmitter runs thirty-five watts, and the receiver is an NC-125. I use a ½-wave antenna on 3.7 Mc. and a ⅝-wave one on 7.2 Mc. 73"—Ralph, WN8NMG.

That takes care of our space this month. Keep those letters and pictures coming. 73, Herb, W9EGQ

YL'S FREQUENCY

(from page 43)

guitar. She also plays the mandolin. John and June have always taken part, singing solos or whatever was needed, even when they were very small.

Just to complete the family affair, they offer an award to anyone who works all four of them on the air. It's a certificate called WAB—Worked All Battins. FB, folks, and good luck to all of you!

14th YLRL Anniversary Contest

The annual YLRL Anniversary Party will be held this year in December. The phone portion of the contest is set for Dec. 5th, and the CW portion for Dec. 12th. Details are given in the box. Join the fun and get acquainted with other YLs. Any and all YLs are invited to participate, but only members of YLRL are eligible for awards.

Conventions

The New Hampshire State Convention on Sept. 13th at Concord drew a record turnout of about thirty-five YLs. The photo, for which our thanks to W1FTJ, shows those who attended the YL meeting. Others at the convention included W1MDV and WN1WVT, and there may have been more. The YL meeting was directed by Peg, W1BCU, assisted by Esther, W1RYJ. Each YL told a little about herself, including call, bands worked, etc. This was followed by a YL QSL card contest, won by W1OAK for her

(Continued on page 65)

(from page 63)

YLRL 14th ANNIVERSARY PARTY RULES

Dates:	Phone: Start Sat., Dec. 5, at 1200 EST. End Sun., Dec. 6, at 2400 EST.
	CW: Start Sat., Dec. 12, at 1200 EST. End Sun., Dec. 13, at 2400 EST.
	[illegible]
Frequencies:	All bands. Cross-band operation, phone to phone and CW to CW, is permitted.
Eligibility:	Contest open to any licensed YL or XYL operators throughout the world. Not limited to YLRL members. Contacts with OM's do not count.
Procedure:	Call "CQ YLRL."
Exchange:	QSO number; RS or RST report; name of State, U. S. Possession, VE District or Country.
Scoring:	a—5 points for each contact.
	b—Same YL may be worked on other bands for additional credit.
	c—Add number of points and then multiply by number of different States, U. S. Possessions, VE Districts and Countries worked. Maryland and District of Columbia count as one state.
	d—All phone contestants running 150 or less watts input at all times may then multiply the final score by 1.5.
	e—All CW contestants running 150 or less watts input at all times may then multiply the final score by 1.25.
Awards:	Highest phone score—Cup
	Highest CW score—Cup
	(These cups are awarded on a yearly basis. Any operator winning the same cup three times gains permanent possession of it.)
	2nd and 3rd place awards to be [illegible].
	Certificate for high score for phone and CW in each U. S. District and Country.
Logs:	Copies of phone and CW contestants logs must be postmarked not later than Dec. 31st, 1953; to be sent directly to Ruth B. Siegelman, W2OWL, Vice-President, YLRL 1414 Wythe Place, Bronx 52, New York.
	When submitting copies of logs, please list phone contacts and CW contacts separately.

oak-leaf QSL card. Her prize was an Englishware dinner plate with a picture of the N.H. State House archway. Following the informal YL get-together, a YLRL meeting was held under the guidance of Ann, W1OAK, first district chairman. Ann gave a door prize which was a title with the State of Vermont on it. She gave a short history of YLRL and nominations were made for first district D/C for next term.

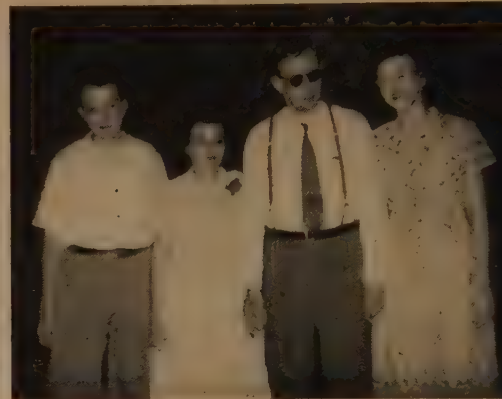
The Delta Division held its convention in New Orleans on Sept. 5-6. Though we have no list of YLs attending, there were some 200 XYLs and YLs who enjoyed the afternoon tea, informal coffee and "Out of Style" show. This depicted styles worn from 1910 through the 30's and apparently was as much enjoyed by the OMs who invaded the entertainment as by the gals. Lots of the ladies went home happy with prizes won, for close to fifty were given away, the top ones a TV set, oriental rug and three sets of dinnerware.

Here and There

W9FZO and W9FSS are now definitely located in Florida. The QTH: 1038 Macy, West Palm Beach.

(Continued on next page)

(from preceding page)



The all-Ham Battin family of Elgin, Ill. L. to r.: John, W9MEM; Edith, OTO; Ev, OWD; and June, OTM. The photo was taken on Aug. 14th, the 20th wedding anniversary of Edith and Ev.

Helen and Ralph send a special thank-you to al the Hams they visited this summer and who extended such grand hospitality.

New check-ins for the NYLON net are W7PQW W7RXT and VE7UF.

September meeting of the Los Angeles YLRC drew twenty-five YLs. In addition to regular club members there were these visitors: W3VNN, W5RFK W6AKE, SGL, QLM, PCO and KN6ACN.

W6EHA, Gen, is new NCS for the YLRL 20-meter net (14,240 kc) beginning Oct. 1st. Gen and her OM, by the way, are sporting a new 32V3, a 75A and a new steel desk to hold 'em. Seems this al comes by way of having lived in a trailer all the time they were in Las Cruces, N.M., and saved paying rent!

33—till next month—W5RZ

PI-NETWORKS

(from page 25)

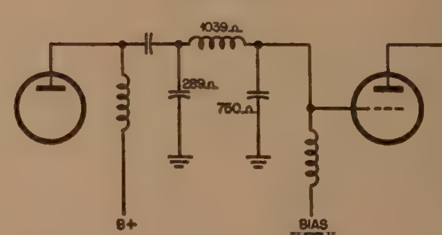


Fig. 6. Final values for solution of second problem.

Conclusion

The pi-network has a definite role in the design of new equipment. It is hoped that th simplified approach may help in understandin how the pi-network may be used. Credit is du to WØEDB for advice and suggestions o this solution.

AMPLITUDE MODULATION REVIEW

(from page 37)

of a final amplifier tube having a third of the dissipation that would be required with constant carrier. The peak d-c power that must be delivered by the power supply, however, is still the same as that for constant-carrier operation with carrier power P_o. To the extent that the required power-supply regulation can be achieved by adding filter capacity, the power-supply requirements approach the average power consumption of about one-fourth the supply required for constant-carrier operation

TABLE 3. SCREEN MODULATION PLATE DISSIPATION P_d=13.5 WATTS			
CARRIER	TOTAL d-c POWER INPUT P_i (WATTS)	AVERAGE CARRIER POWER OUTPUT (WATTS)	PEAK-MODULATION CARRIER OUTPUT P_o (WATTS)
CONSTANT	22	7.3	7.3
CONTROLLED	17*	1.4●	22

* WITH PERFECT POWER SUPPLY REGULATION
● WITH MODULATION. CARRIER POWER ZERO WITH NO MODULATION.

with carrier power P_o. *Table 3* compares the peak-modulation carrier output power, the average carrier output, and the d-c power input required for operation of the final at 13.5 watts plate dissipation.

Conclusions

The questions posed at the beginning of this article can now be given definite answers on the basis of our calculations. As far as overall power efficiency is concerned, there is no particular reason for choosing one type of modulation over another; the difference between the most efficient method and the least efficient is less than one decibel. The choice must be made, therefore, on the basis either of convenience or of equipment simplicity. For a given final amplifier tube whose power input is limited by tolerable plate dissipation, and for constant-carrier operation, plate modulation allows a carrier power output about three times greater than screen modulation. Because of limitations on final amplifier plate voltage and current, controlled-carrier operation yields no practical increase in peak-modulation output for plate modulation. For screen modulation, the use of controlled carrier allows about three times the peak-modulation carrier output of constant-carrier operation with an average carrier output that is considerably less.

MAIL ORDER ANTENNA

(from page 37)

in the coaxial feed line. Set the shorting bar a an arbitrary position and feed a small amoun of r-f energy at the desired frequency into th feed line. Adjust the variable condenser fo minimum SWR. If the SWR is higher than de sired, change the position of the shorting ba slightly and re-adjust the variable condenser Repeat as often as necessary to reduce the SWI to a satisfactory value.

This procedure assumes that the radiator i self is fairly close to resonance, so that it wi efficiently radiate the power fed into it. Thi is a valid assumption, especially as the larg diameter of the radiator reduces its *Q*, makin its length non-critical. The relatively-sma length/diameter ratio is also the reason th recommended radiator length is somewhat le than that of a conventional ¼-wave antenn constructed of wire or small-diameter tubing.

For a given set of conditions, the position c the shorting bar and the capacity of the serie condenser can be calculated with fair accurac by making certain asumptions. However, be results still require a cut-and-try procedur therefore the mathematics are omitted. Antenn design is an art, not a science! However, thanl are due to W6DSZ of the Antenna Laborator University of California, for his original assi tance in calculating constants for the fee system.

Life Expectancy Of Antenna

All metal is subject to corrosion, especial when in contact with the earth. Aluminum no exception; therefore a check was made wi a metallurgist on the life that can be expect from this antenna. The following is based up his report:

If the antenna is installed in dry, sandy so its life will be indefinite. In normally-moist so which is essentially chemically neutral, a *mi mum* life of five years can be expected. In w heavily-alkaline or acid soil, corrosion is mo intense and the useful life will decrease. If doubt of the type of soil in your yard, an easy- use kit for testing its acidity or alkalinity may obtained from any garden-supply store.

The critical point is at the ground level the vertical member. Corrosive pitting of t tubing will decrease its strength, and hea winds might snap off the antenna. This p sibility can be greatly decreased by driving five-foot wooden "round" inside the tubing; that the point of maximum stress will be rai about a foot above the ground, where it will isolated from corrosive effects of the earth.

Do not saturate the base of the antenna i lt or sea water will corrode aluminum practi salt solution to decrease the ground resista ly while you watch.

COMMENTARIES

(from page 29)

theoretical aspect that increased signal strengths may be expected if some care is taken in developing a suitable vertically directive array. While they particularly mention a broadside array of dipoles, it appeared that comparable results might be obtained using a single horizontal wire below the radiator acting as a reflector. This idea was put into practice as shown in *Fig. 1*.

This antenna was cut for the 40-meter band and has a reflector mounted one-tenth wavelength below the radiator. The reflector was tuned with a short stub at the center in order to avoid pruning the ends. Tuning was accomplished by adjusting the stub for a minimum reading on a field strength meter directly below the reflector. The field strength meter had a horizontal antenna of the miniature variety.

The SWR would reach a value of 1.3:1 for any frequency to which the reflector was adjusted. It rose to 2:1 about 75 kc. either side of this frequency.

High Angle Results

Excellent results were obtained with this antenna. Stations from 40 to about 350 miles away reported that my signals were louder with the high-angle radiator than they were with the vertical. Some stations reported a 20 db. increase in signal strength. The general of improvement was of the order of 1½ S-units. At distances of 350 to 600 miles the two antennas seemed to be about equal. Beyond this the vertical took over (these tests were at night) and during the daytime the vertical was the better antenna at any distance.

A bonus with this type of antenna is the reduction of night-time static that arrives via fairly low angles. Using the high angle radiator I was often able to read DX signals that were buried in the static on the vertical.

Further Experiments Needed

Many questions remain to be answered regarding this type of radiator. I feel that a beam consisting of two elements spaced a quarter-wavelength and fed 90 degrees out-of-phase will produce a considerably broader radiation pattern than this parasitic array. There is some indication that this radiator/reflector shown in *Fig. 1* is too sharp.

This idea will probably work best on 75-meters where high-angle radiation is somewhat more important. In any case, the high-angle beam is not offered as a DX catcher, but it does have possibilities for traffic work, contests and medium distant QSO's.

Major R. H. Mitchell, W6TZB

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